Nelson Spaulding

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# JOURNAL *of* FORESTRY

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Application has been made for transfer of second-class entry from Menasha, Wis., to Baltimore, Md.

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JOURNAL of FORESTRY

VOL. XXVI OCTOBER, 1928 No. 6

*The Society is not responsible, as a body, for the facts and opinions advanced in the papers published by it.*

# EDITORIAL

A GREAT editor has retired. To Raphael Zon is due primarily the effective leadership which the JOURNAL OF FORESTRY has exercised in the development of forestry in the United States and its enviable reputation abroad. His high ideals, his broad sympathy, his firm belief that truth is to be found only in the clash of divergent opinions, and his unfailing good judgment have combined to make the JOURNAL a powerful and stimulating force. No one will begrudge him the rest he has so richly earned; every one will regret that he is no longer at the helm.

Zon's successor is under no illusions as to the difficulty of the task which he has undertaken, or as to his own limitations. The very fact that the JOURNAL OF FORESTRY has achieved so high a standard, while a help from one point of view, involves increased responsibility from another. I therefore ask the forbearance of readers of the JOURNAL during my period of orientation, and their permanent cooperation. In taking over the business management of the JOURNAL the secretary has relieved the editor of a heavy burden, but perhaps has thereby made him more strictly accountable for satisfactory performance in the editorial field. This will be possible only with the whole-hearted assistance of the other members of the editorial board and the readers of the JOURNAL generally.

With respect to policy and procedure the present editor contemplates no radical changes. My chief concern is to meet the high standards set by my predecessor and to make the JOURNAL representative of the entire profession. Contributions will, therefore, be welcome from individuals in all lines of work and in positions of all degrees of official responsibility. Decision as to the publication of specific articles will be based entirely on the originality, timeliness, and interest of their content and presentation. It is hoped that more cuts and illustrations can be used than has been possible in the past and that a more liberal policy may be feasible in regard to reprints. Suggestions as to improvements will be welcome at any time from any reader of the JOURNAL.

One question which has already caused some discussion is as to the amount of space which should be devoted to society affairs. My own feeling is that the JOURNAL OF FORESTRY is primarily a forum for the consideration of scientific and technical problems of interest to the profession. At the same time, so long as it offers the only effective means of keeping members in touch with Society affairs, as is now the case, I believe that the liberal use of space for this purpose is not only justified, but practically im-

perative. I therefore hope that any who feel that excessive space is being devoted to this department will bear with the situation until some other means of handling it can be devised.

The current issue presents for the consideration of the membership one Society matter of major importance—the revision of the constitution. Much time and thought has been given to the proposed revision by the special committee and the Executive Council, and I have no hesitation in using my editorial prerogative to urge favorable action on it. Aside from other improvements, the adoption of the Hare system of proportional representation would be of outstanding value. It is difficult to conceive of any other way of avoiding the well-recognized difficulties which have previously been met in electing officers really representative of the various elements in the society. Experience has proved the effectiveness of the Hare system in accomplishing such representation in other organizations; there is every reason to believe that it will prove equally effective in the Society of American Foresters. Those who have studied the proposal most carefully are unanimous in their belief that, whatever minor difficulties there may be in the proposed revision, the advantages to be gained from the adoption of proportional representation are more than sufficient to justify a favorable vote.

S. T. DANA.

# VOCATIONAL TRAINING IN FORESTRY[1]

By HENRY S. GRAVES

*Dean, Yale School of Forestry*

## Scope of Forest Education

IT IS commonly said that the future of forestry depends on the character and efficiency of our forest schools. This is true provided that we develop a system of education broad enough in scope to include both professional and vocational training in forestry. We must look to the higher schools to build up a body of well-trained technical foresters. Upon them will fall the direction of the vast forestry enterprise of the country, the development and supervision of public activities, the working out of the more complex problems of private forestry, the advancement of the knowledge of forestry through scientific research and experiment, and the task of forest education in all its various aspects. They should be given the best educational facilities that our colleges and universities can provide.

The problem of forest education, however, extends beyond the professional school. The future of forestry is dependent not only on the ability, vision, and sound judgment of the professional foresters, but also on the intelligence and skill of the men down the line—the superintendents and foremen of local forest activities and the workers in the woods and at the mill. In applying forestry there will be a great number of persons engaged in important activities who should have some knowledge of the purposes and methods of forestry, but who do not need a college training. We may develop sound policies of forest management and work out a plan of silviculture and protection that are correct and practical, and yet utterly fail in their application if the men who do the actual work on the ground are unenlightened, without technical skill, or unsympathetic. The key to successful work in forest protection, silviculture, or utilization is oftentimes the interest, enthusiasm, and ability of the local field officer, the ranger, the woods foreman, or logging boss. The training of these men for their special work in the forestry undertaking is as important as that of the professional forester.

Heretofore our educational efforts have been directed chiefly to the collegiate school and the training of men for the directive work in forestry. We have largely neglected the problem of training men for the special jobs in the forest and factory and for the secondary executive positions for which a collegiate training is neither necessary nor suitable. We have in the United States twenty-five collegiate institutions offering a training in forestry, and only one regularly established ranger school, namely the institution whose progress and success we are celebrating today. The North Dakota College of Forestry, which is a junior college in character, offers a training designed to meet the

[1] Address delivered at the dedication and educational conference, New York State Ranger School, Wanakena, N. Y., August 24-25, 1928.

practical needs of woodland owners and others operating in the state and region, and some of the collegiate schools offer short courses in forestry for farm owners, rangers, and others.

Our system of forest education is ill balanced. We have more collegiate schools than are necessary, more than can be properly supported, and more than can maintain a high standard of educational efficiency. We have not made adequate provision for vocational schools below college grades and for the extension activities that form a part of a system of vocational education.

### The Problem in the Forest Service

One of the most difficult problems of the Forest Service in the administration of the National Forests has been the building up of a competent local field force. This applies to the more important supervisory officers and also to the rank and file of men engaged in fire protection, in construction and maintenance of trails, telephone lines, and other improvements, in scaling, in handling minor timber sales, and in performing a multitude of other tasks of a quasi-technical character. The final success of the management of the forests depends on the local men. The whole system of fire protection falls down if the rangers, guards, look-out men, patrolmen, camp foremen, straw bosses, and other key men are incompetent. Many a time a fire has gotten beyond control and become a conflagration because of the incompetence of a single man in the organization. And in other phases of forest work no amount of general supervision and inspection will insure good results if the local men are inefficient.

This local work is of an intensely practical character. Ability to handle men, experience in the woods, knowledge of the region, and some practical training in forestry are essential qualities for success. Men with this combination of qualities have been difficult to find, and the Forest Service has had to build up its local organizations largely by recruiting practical men and then giving them their technical training on the job.

### The Situation in the Lumber Industry

An increasing volume of criticism is being directed to the lack of progress in forestry on private timberlands. We are not getting the principles of forestry applied in the forest to the extent that is wholly justified by present economic conditions. Practice is lagging unnecessarily far behind theory. Outside the public forests the efforts to cut timber with a view to continued forest production are pitifully small. There are a large number of private owners and operators who are participating in the general system of fire protection. Some have undertaken to go further and are leaving trees for future growth or for seed, and some are planting up denuded lands. But the area of land cut over each year with a view to continued forest growth and in accordance with measures that are really effective in accomplishing this end remains exceedingly small. The slow progress in private forestry is due in part to the fact that the officers of many lumber companies do not really believe in the necessity of forestry on their lands. Little can be accomplished, of course, unless the head of the log-

ging department has the authority to use measures of forestry in the woods and is himself convinced of their need. Even then the success of the work depends in the final analysis on the intelligent work of the woods foremen and local bosses.

It is said that we cut over about 10 million acres of forest every year. Our greatest problem of forestry is to insure that on this vast aggregate area measures are taken for the reestablishment of a growth of trees of potential value. In addition to fire protection there are required measures looking to forest production that to an extent modify the usual lumbering methods. The work is done by the regular operating organization. It means that the men in the organization must adapt themselves to a new point of view and must adopt certain changes in routine woods processes. The foreman often does not understand the purposes of forestry; the proposals may seem to him unnecessary and impractical; he may be wholly unreceptive to the forestry idea; he may be incompetent to modify in any way the methods of logging which have been used for a generation or more.

Why is it that the planting of trees on denuded land is the only feature of forestry that interests many lumbermen? They invest considerable sums in trying to restore old burns on treeless land and at the same time neglect the measures of forestry in the woods that are definitely to the advantage of the owners. One reason is that they can organize the work of planting separately from their regular operations. The planting is done by a separate crew. The work can be continued or cut off at any time. The routine of logging is not disturbed in the slightest. Every encouragement should be given to those lumbermen who are inaugurating systems of tree planting, but they should not delude themselves in the belief that they are touching the real problem of forestry on their lands, which involves the way their timber is cut and the condition in which the forest is left. I do not believe that they will make much progress in adopting methods essential for forest perpetuation, or indeed effective measures for reducing unnecessary woods waste, until the field force and especially the foremen have the benefits of some instruction of the vocational type in forestry principles and methods.

## Trained Men for Small Tracts

The foregoing are illustrations of the need of men with practical training in forestry to occupy positions of intermediate responsibility in the large forest organizations, whether public or private. These men are the non-commissioned officers of the civil establishment and are as important as in the army. There is a need also of men with practical training in forestry in many enterprises not directly connected with lumber companies or with public undertakings. Over 30 per cent of the forests of the country are in small ownership. These range from the farm woodlot to areas of five thousand acres or more. The farmer must usually be his own forester. But there are a large number of tracts of moderate size whose owners desire to apply the principles of forestry in their management but who are doing nothing in forestry because of the difficulty of obtaining competent woods managers. The tracts are not large

enough to employ a trained forester as a resident manager. There is needed a practical foreman who has had some training in forestry. He must be experienced in woods work, competent to handle men, equipped to supervise the setting up and running of a small mill, able to market woods products, and the like, as well as trained in the practical application of the principles of silviculture. Such men are very hard to find. They are the key to forestry on the small private timber tract, such as we have in great abundance in the eastern part of the country.

### The Place of Vocational Training

The illustrations given in the foregoing pages suffice to show that we have a problem of forest education that is not being met by the collegiate forest school. For the positions and class of work I have been discussing there are needed men who have had a background of experience in the woods or mill, and who are interested in occupying a permanent position in forest or mill work. The graduate forester is usually unwilling, after four or more years of college work, to remain in a subordinate position except for a short period in order to gain some practical experience. Moreover, his training in college does not fit him to do the work of the local executive. I do not refer to those positions in forest work that call for special engineering and forestry knowledge, or the position of district ranger in the National Forests which in many cases require a high order of special technical knowledge and ability. Graduate foresters of the right qualifications are well suited and are needed for such positions. I refer rather to the places of intermediate responsibility where experience on the job and practical woods knowledge are of maximum importance and there is less call for the special technical knowledge of the trained forester.

One reason for the criticism of our forest schools by employers is that they have hired technical foresters when they really needed men of practical experience who have had some vocational training for the special type of forestry work in question. When I want a man to take charge of a small tract of forest land, I do not go to my own or any other collegiate forest school; I look first to the New York State Ranger School (and I have recently employed one of its graduates), or I endeavor to train a man on the job. And many other employers are in the same position.

It is the task of vocational education to meet this pressing need for better trained field personnel in the forest and mill. The recognition of this situation does not in any way minimize the importance of the collegiate school and of advanced educational work in forestry. Organized vocational education would supplement the work of the regular forest schools. It would fill a wide gap in our present structure of forest education.

### What is Vocational Training?

Before proceeding further it may be advisable to make clear just what is meant by vocational training. In one sense all professional schools are vocational, for they aim to prepare men for a specific vocation. From this standpoint schools of law, medicine, theology,

architecture, engineering, agriculture, and forestry are vocational. Increasingly the institutions of collegiate character which offer a training for the vocations are termed professional schools. Our colleges seem to resent the implication that they are vocational institutions, though I notice that the forest schools are desirous of being known as very "practical." Of course there is a good deal of nonsense in the fear of the use of the term "vocational" in connection with training for the professions, for all good schools constantly make use of some of the principles of vocational training.

The expression vocational training is today commonly applied to systematic training for specific trades, crafts, and industrial positions and jobs. We hear most about vocational training in connection with the manufacturing industries, the mechanic arts, and agriculture, and with instruction less formally organized under the auspices of the industries. The different types of vocational schools cover a wide range and under the general head of vocational training falls the systematic instruction provided for men already employed, whether this is individual in character or conducted through organized classes.

The formal organization of the work of vocational training generally in vogue does not interest us in this discussion so much as the educational principle involved. The objective is to train the student to perform certain definite tasks in his chosen vocation. He is brought into direct contact with the problems with which he will have to deal, and as a part of his training he is given extended practice in the processes and procedures in order to attain the necessary skill in them. In the industrial vocations this practical work may be in the factory or shop or at a school where the conditions of an industrial plant are duplicated as far as may be possible. The student is shown the reasons for the methods used in specified processes and there is supplemental class instruction for such work of a specific and general educational character as may be required. By repetition under direction the student acquires manipulative skill and technique; by class work and various instructional devices his intellectual interest in the work is stimulated and he is given the opportunity to broaden his knowledge by the study of principles and by general reading.

## Contrast with the Academic Type of Training

It is readily seen that the educational approach is quite different from that of the old line night school and of the collegiate institution. Thus, the forest school of collegiate type requires of the student a certain general educational background. It provides courses in the fundamental sciences, mathematics, and economics. The aim in the technical courses is to train the student in principles and to develop his powers of applying these principles under the varying and often novel conditions that he may encounter. Practical work in the woods and at the factory is designed to acquaint him with industrial and economic conditions, and to illustrate and give point to the principles of forestry. Good teaching in a professional school is objective in character and follows the project principle as far as feasible, but the emphasis is on principles rather than on

processes and procedures. Practical field work is an instrument to clarify and fix principles rather than an end in itself to develop skill and technique.

The vocational theory of education is not by any means confined to the mechanician of a given vocation. It is also used today in many technological schools of the higher grades. The principle is applied in the so-called cooperative school, where the student divides his time between the class room and the shop. As applied in the advanced grades it is often called the Schneides or Cincinnati plan. The student works for, say, six months at the college and then spends six months in a factory where he has a chance to apply in practice the principles he has learned at college. This process is continued through his course. In the present discussion, however, our interest is more particularly in the type of vocational education needed to train skilled workers and executives of the foreman grade rather than to enter upon the possible use of vocational methods in the higher forest schools.

### Vocational Training by the Industries

Vocational education has been developed through industrial necessity. The tremendous expansion of production in industry has been made possible through the contributions of science and invention. Industrial processes have been revolutionized and they are constantly being changed and improved. This progress has called for high skill on the part of workers and has opened up new opportunities for the technician. Moreover the advances in industrial discovery and invention demand new skills and technique to replace the old, higher standards of efficiency on the part of the worker, and greater adaptation to new processes and changing conditions than formerly. The old method of learning a trade by serving as an apprentice under a master worker has long since passed away. For a time nothing in the way of organized training for a trade or craft took its place. The recruits in an industry learned by absorption. Such training as was given was unorganized. Occasional foreman took special pains in directing the work of the new men. More often they picked up what they could and by sheer individual effort acquired technical skill and knowledge. The great inudustries discovered that efficiency in production necessitated a more rapid and effective method of training new workers and that it paid to provide facilities for the men already in an organization to enlarge their technical knowledge and skill. The industries, therefore, proceeded to develop systems of vocational education for their own employees, in order to train men for the specific work and conditions of their own establishments.

The character and organization of the vocational work of the industries varies greatly from systematic instruction by a foreman or assistant foreman to highly developed corporation schools. The training in a typical industrial establishment consists first of the vestibule course, during which the worker is under the immediate instruction and guidance of a foreman or instructor foreman. This lasts perhaps six months. Then follows a period of several months during which the employee works on his job part time and during the balance of his time is given systematic class work. If he shows

marked improvement and promise he is taken on as a qualified employee, and thereafter is given an oportunity to attend voluntary evening classes to enlarge his kowledge in subjects appropriate to the particular work in which he is engaged, and also in such general subjects as English, mathematics, drawing, etc. In the larger corporations the same principles are applied in the instruction of young men who by their previous training may be qualified as engineers or specialists in other lines, or as prospective executives in the staff organization.

The system enables the corporation to develop efficient workers in a minimum period. The process of training eliminates the incompetent and permits through appropriate tests the determination of the natural aptitudes of the individuals and their placement in positions for which they are best equipped.

The movement for vocational training by the industries has expanded to very large proportions. Most of the larger industrial corporations have their systems of vocational training, as a definite part of their organized personnel management. For the advancement of the undertaking the great industrial associations participate in the study of methods, principles of organization, and development of aptitude tests and similar matters. Some associations have also organized vocational schools conducted in cooperation with the manufacturing establishments.

### Organized Vocational Schools

The system of vocational training education briefly described in the foregoing is in the nature of training on the job. During recent years there has been a great development of vocational schools, supported by the public and in some cases by private endowment. The idea back of the establishment of the colleges of agriculture and mechanic arts was vocational, though these institutions have to a considerable extent been transformed to institutions of higher learning employing academic rather than vocational methods of instruction.

The enactment of the Vocational Educational Act of 1917, which provides about seven million dollars a year for cooperation with the states in the conduct of vocational educational work, has given a great stimulus to the development of organized vocational schools. The law requires that the beneficiary states or localities contribute an amount equal to that allotted by the Government. In point of fact the states and localities already are contributing much more than the Government to the federally aided vocational schools.

### Vocational Training by the Forest Industries

Taking the forest enterprise as a whole, a considerable amount of vocational training is under way today, though much of it is not formally organized. The larger wood-using industries, like other manufacturing industries, are interesting themselves in systematic methods of training their personnel. The International Paper Company and other pulp and paper concerns have their special systems of instruction for their employees, though it is confined, I believe, to the manufacturing and merchandising phases of their enterprises and does not extend to work in the woods. The interest of the wood-using

industries in vocational training is evidenced by their cooperation with the special conferences for foremen arranged by the Government at the Forest Products Laboratory in Madison.

Lumber companies have confined their vocational efforts to training men for mill work and as salesmen. Vocational training for better woods practice has been neglected, though there is a measure of training on the job for the fire protection organization. We should include also the work of training of foremen in forestry methods by a few companies which have genuinely undertaken to carry forestry into the actual logging operations.

### Work on the National Forests

I have already explained that the Forest Service has been obliged for the most part to train its subordinate service " on the job." About 1908 the Service undertook to organize a series of ranger conferences or schools for the training of its field employees. Selected men were detailed at Government expense to attend these conferences conducted in camp for periods of several weeks at a time in different National Forest Districts. The plan was admirable and calculated greatly to increase the efficiency of the organization. Unfortunately a technicality of the law prevented the use of existing appropriations for the expenses of the forest officers in attending such conferences and the plan was abandoned to the embarrassment of the Service and its work. The instructional work was, however, continued in various ways. Individual instruction of new men by the rangers and higher officers, reading courses, and other devices were substituted.

Several of the western forest schools offered short extension or continuation courses for rangers on leave of absence; and recently means were found to bring groups of men together for formal instruction in National Forest procedures, at which time the underlying policies of silviculture, protection, and forest management are expounded and discussed.

The state forest organizations have also undertaken methods of training the field personnel. From time to time the state fire wardens in various of the states meet together for a practical discussion of their problems. The state forester circulates information of value to the men in the field and various other means are devised to increase the knowledge and stimulate self improvement on the part of the local district forester, fire warden, or others, in the organization.

### The Ranger School

Fifteen to twenty years ago the ranger school was discussed much more than in recent years. It formed a prominent topic at the forest school conference in 1910, and reports and articles were written in an effort to indicate what should be included in the courses of instruction. Only one institution, the New York State College of Forestry, seriously undertook a definite establishment for instruction of secondary grade.

The question is pertinent why there were not more ranger schools established. The need is obvious. Each year the Forest Service appoints no less than 40 persons from the civil service register for rangers, and there is certainly an outlet for properly qualified men in private employ. In the long run there will be required more men with a practical

vocational training than professional foresters with a collegiate education.

The reasons for this situation are related to the fundamental requirements of successful vocational training in forestry, which may be enumerated as follows:

1. The vocational school (or ranger school) should be located in the forest where the student may be given practical training in the actual processes which he will employ in his later work. The school should be associated with a forest under management, where lumber operations are under way and the student can take part in the work of protection, marking timber for various types of cutting, removal and transport of logs, disposal of brush when necessary, work in the mill, and marketing of products. Under our prevailing conditions such forests, where the operations are reasonably concentrated and permanent in character, have been difficult to find.

2. A vocational school requires special buildings and other equipment and an adequate corps of instructors. It has been difficult to obtain the financial support for such an establishment. The cost is considerable and is more than has been involved in the inauguration of some of our collegiate schools where existing buildings are used and members of other departments are requisitioned to give a part of the instruction.

3. The instruction is strictly vocational in character. Educators usually have thought of all instruction in forestry from the academic point of view. They have tended to associate in their minds the work of ranger training with some existing college. The conception has been to provide an abridged course, but to employ the academic approach and methods, with perhaps a larger amount of field work than is given in college. Even then the conception of field work is usually to provide exercises in the field rather than to bring the student into his vocational undertaking as an actual worker. This very attitude of the educator has tended to divert his efforts to the regular collegiate school.

4. The teacher in a vocational school must be a master of the practical side of his vocation. Such men are few in number. Most foresters have been employed on some special phase of forestry in a large organization like the Forest Service. Not many have had the opportunity themselves to handle forest properties with the full responsibility for all its activities including the manufacture and marketing of the products. Vocational teaching is more exacting in many ways than academic teaching.

5. The vocational school must be able to recruit a type of student who will be adapted to meet the practical needs of the employer. Lumbermen and public organizations as well are fearful of the school type of forester for the practical class of work which I have been discussing. They prefer to select their own men, those who have had experience in the woods or at a saw mill, who have an aptitude for mechanical work, who have been accustomed to meet emergencies, and are natural executives, and then train them on the job. If young men of this type could be given a training at a ranger school there would be no question of their employment. The fear that a ranger school would attract the town or city boy has prevented the encouragement by prospective employers of the establishment of such schools, and the educators themselves have perhaps had

some question regarding the outlet for the graduates.

We have a situation analogous to that in the manufacturing industries. Many concerns have found that they could not rely on the schools to furnish them qualified men. So they select their own men and train them on the job. This had been an effective challenge to the vocational schools to provide a training that can really be capitalized by the student in his vocation. Their close cooperation with the industries is bringing about a new confidence in them, resulting in benefit to the industries, the schools, and the students.

## A System of Vocational Training in Forestry

The needs of the country for vocational training in forestry will not be met by a single type of school, on account of the wide diversification of the problems of forestry and of the requirements of emyloyers. The ranger school as we have usually conceived it will fit into the general structure of vocational education which will include several types of schools and also the various plans of instruction that are less formally organized. For the purposes of the present discussion we may distinguish (1) the independent school, (2) the cooperative school, and (3) organized training by employers.

### The Independent School

Under this head is included such institutions as the New York State Ranger School and other schools offering full-time instruction in forestry. Their work is centered about their own forests, experimental tracts, and laboratories. They are designed to provide a training for the non-commissioned officers of large forestry enterprises, and for managers of small tracts, nurseries, and similar independent undertakings. They correspond to the intermediate forest schools of some foreign countries and to the "special vocational school" in the system of industrial vocational schools.

These schools should be equipped with their own instructional forests, which should be large enough for continuous operations; or associated with public or private forests that are under systematic forest management. The course ordinarily will cover a period of one year. But I believe that in the long run the one-year course will be chiefly for those who already have had a background of woods experience, and that the young men who have not had such an experience should remain a longer period in order to obtain an extended training as actual workers in all the phases of logging, mill, and marketing work.

Some foresters have expressed the fear that this type of school will encourage the young man who wishes to take a short cut into the field of technical forestry, and will tend to lower the standard of the profession. Such a fear is groundless if the schools are really vocational in character and method of training. If any of the graduates by their ability rise to places of importance, as some are certain to do, and compete with the college trained forester, it is a circumstance to be welcomed and not feared. I should like to see a feature of competition of this sort and a challenge to the technical forester.

### The Cooperative School

This type of school is conducted in cooperation with an industrial establishment. The student alternates for specified periods between the school and the plant. While at the plant he is under regular employment, but by arrangement with the company is given work that fits in with a definite plan of training. This plan of instruction may well be adapted to forestry. The various processes and procedures are learned by the student under real industrial conditions. He absorbs many things that can not be taught on a school forest. At the same time he is given during his period of work at the school a type of instruction better organized and more skilfully conducted than is possible by the ordinary lumber company in a corporation school. The cooperative school has been found to be very successful in the manufacturing industries. As applied to forestry, it would require less outlay in plant, and its instruction could be made more flexible than in meeting the needs of individuals than in the case of the independent school.

### Vocational Training by Employers

In this category are included employers' or corporation schools and other systematic efforts to increase the knowledge and skill of the members of an organization. Probably most private companies will be more interested in this type of vocational training than in a separate school. It gives them an opportunity to select their own recruits and then to train them in the special conditions of an individual enterprise under the guidance of men already in the organization. There is no reason why the large lumber companies should not introduce systematic vocational training at the mill at once. I have no doubt that many would say that this is now being done through the apprenticeship method and the instruction of the foremen. In most of the cases with which I am familiar there is still in vogue the so-called "pick-up" system under which the recruit is given orders and acquires the needed skill as best he can. Those who do not qualify with reasonable rapidity are dropped and others brought in to take their place. Other manufacturing industries have found that this system is very wasteful of effort and also that by more systematic training the average standard of skill is very materially enhanced.

The problem of vocational training for woods work is more difficult than at the mill. In the first place there is a different class of worker, usually less competent to adapt himself to new methods. Furthermore, at the mill the workers are centralized; it is easy to inspect and supervise their work; and there is greater degree of solidarity in the personnel. These circumstances and the character of the work itself at the mill make it easier to establish standards of efficiency and to make readjustments to new techniques.

Mention should also be made of the attitude of the average company manager. In a great many cases the manager has worked up through the manufacturing or merchandising department, and not through the logging department. In consequence he is better informed in regard to the manufacturing processes and sales problems than the woods operations. He is interested primarily in logs, and looks upon them rather than the

standing timber as his raw material. The mill is under constant inspection, while the forest is far less visited by the manager or other officers of the company. The woods superintendent and foremen are left largely to their own devices, so long as logs are delivered in sufficient quantities and at costs that are deemed proper. It is difficult for the manager under such circumstances to appreciate how a more intelligent care and greater skill in the woods will result in a financial gain, and the woods problems, with all the complications of topography, character of soil, occurrence of trees, varying character of log grades, etc., are such that it is easy for the foreman to convince the manager that no modification of prevailing methods is possible.

When the element of forestry is introduced there is a further difficulty because it involves a point of view and a technique unfamiliar to the members of the lumber company. It is obvious that if any advance in woods methods is to be made there must first be an appreciation on the part of the manager of the necessity and possibilities of improvement over the old-time methods, and the woods foremen must have at least enough interest and knowledge to carry out the needed measures on the ground. How then is he to acquire this knowledge? Of course the answer is to employ a forester, one of whose functions would be to help in training the woods force in the practical carrying out of the forestry program of the company. There would also be an opportunity for the vocational schools to aid private owners in extending instruction in forestry to foremen and other members of woods organizations. There are many devices that could be used for such extension work, such as local conferences similar to the "classes" for factory foremen at the Madison Laboratory, short courses for men on leave of absence, personal visits by instructors to private tracts, correspondence courses, and the like.

Reference has already been made to the work of the U. S. Forest Service in training members of its field organization. One of the most urgent administrative problems of the Service is the development of a system for training men for the protective force and for subordinate positions in general executive work under the district ranger. In the long run I believe that the best results would be obtained through vocational schools conducted by the Forest Service itself. I have some doubt whether the general vocational school supported privately or by the state will meet the needs of the Government. Foreign Governments have found it necessary to conduct their own forest schools. Under our system the higher training in forestry should be provided by the state and privately endowed colleges and universities.

The vocational training directed to the special local requirements of National Forest administration would best be met by instruction under the immediate control of the Forest Service. This would require special authority and financial support of the Government, but the magnitude of the enterprise and the gain in efficiency that could be achieved would fully justify the undertaking. If such a system were established there would be combined with it the continuation or "up-grade" instruction for forest officers in the higher positions, analagous to that afforded to officers in our military establishments.

## Methods of Vocational Training

In the foregoing discussion I have not undertaken to describe the subject matter of instruction or the specific methods of teaching in vocational training in forestry. I have endeavored rather to set forth certain principles that I believe should underlie the development of a system of vocational training. In working out a plan of vocational training, whether organized under an established school or otherwise, many new problems of method would present themselves. The experience in vocational training in industry and agriculture offers illustrations that are of great value, even though the conditions may be quite different. If there is proper financial support of a given enterprise of vocational training in forestry, and a competent staff of instructors, I would be confident that methods, efficient and adapted to prevailing conditions, would be developed.

# COMMENTS ON FOREST EDUCATION

By P. A. HERBERT

*Associate Forester, Forest Taxation Inquiry, U. S. Forest Service*

OUR educators take a heterogeneous mass of raw material, run it through a process of fabrication which of necessity must be standardized to a large degree, and try to turn out a product to meet a million diverse demands. Small wonder that our system of education is constantly under fire by those who find instances where the product does not meet some specific requirement! Especially is this true of any comparatively new pedagogical effort, such as forestry education, in which must be combined gleanings from many fields of knowledge.

Dean Henry S. Graves, in his clear analysis of some of the problems of forest education,[1] states that " . . . . the preparation of the students who enter the forest school is uneven and often inadequate." This is one of the major faults of our educational system. Practically every freshman course, and even many in the sophomore year, in most of our colleges, could and should be given by our present four-year high schools. The average high school student has the mental capacity to absorb such subject matter, and there is ample room on the high school curriculum for it, if educators will accept the fact which is steadily, if slowly, forging to the front, that *required* course material must be discarded whose subject matter bears no direct relation to the work or the play of the present-day world. There is no excuse today for subject matter in the required secondary school curriculum whose only attribute is mind training; much of our mathematics and foreign language requirements can only be justified for the average student on this ground. Furthermore, some of the first-year college courses are little more than a duplication of subject matter that has already been presented to the student in the last year of high school. Foresters will do well to vigorously support our modern pedagogical experts who are valiantly battling to overcome the inertia of long established custom so that our secondary school curriculum can be properly adjusted.

A high school curriculum containing the fundamentals usually taught in the first year of college will produce a type of individual admirably able to absorb the practical knowledge of forestry that should be presented in the vocational forest school that Graves discusses. For such men one year of vocational training should suffice; for men with the ordinary high school training, it seems that an additional year of basic instruction in the sciences is usually necessary before he can intelligently apply the art of forestry.

Vocational training will become a more important factor in the field of forestry education as the practice of private forestry increases. Such training will produce men prepared to fill and *satisfied to stay* in junior administrative positions of which the rangers', district wardens', and forest custodians' posi-

[1] "Some Considerations of Policy in Forest Education," JOURNAL OF FORESTRY 26:4:430-453, April, 1928.

tions are examples. It is idle to expect men with the training and mental capacity that we find in the university graduates to consider such positions more than a stepping stone to something better, whereas it is obvious that to secure the most efficient type of administration, the turnover in these positions should be reasonably small. Hence, the urgent need for men with the maximum training consistent with the needs and limitations of such positions. Schools offering one year of basic science for those requiring it and one year of practical forestry training, will attract men who will consider such positions as life's goal and who will be content with a remuneration of from $1500 to $2500 per year.

For the time being, at least, vocational forestry training must be given by schools of full collegiate rank that have the facilities to carry on intensive practical forestry training. However, the fundamental differences between vocational training and that of collegiate rank in the type of student, the character of the instruction, and the training of the teacher, make it questionable whether this is generally desirable. Such vocational training partakes more of the nature of post graduate high school work than it does of college instruction. It is possible with the development of the 6-4-4 plan of organization that the junior colleges or senior high schools, *i. e.,* schools that offer as their maximum instruction courses of the present freshman and sophomore years, will assume the burden of vocational forestry training where they have the facilities to do so.

Various writers have stressed the many types of problems that the forester must meet as an explanation of the difficulty of arranging a forest school curriculum satisfactory to all. Perhaps forestry has been too grasping and covers too wide a field. Certainly, our forest schools teach more than the Society of American Foresters' definition of forestry would indicate as their proper scope, *i. e.,* "The science and art of managing a forest in continuity for forest purposes." Rather do our schools teach that it is the application of many widely different sciences and arts to the business of growing, harvesting, and utilizing the products of forest trees and forest land. The schools should be glad to turn over to others those phases of forestry that are on the margin between forestry and other educational divisions; city forestry might well go to landscape architecture and the specialized mechanical and biological phases of forestry to their respective divisions.

Were forestry more narrowly defined, then would our forest school be less tempted to ". . . . undertake more than is justified by the size of the staff," and would be better able to achieve their "peculiar objectives" (where such exist). It is high time that our forest schools, as well as our universities, break away from a too literal interpretation of Newman's definition—"a school of knowledge of every kind, consisting of teachers and learners from every quarter."

The charges that mass education is poor education, and that every member of the faculty should have time to do constructive work, may not be true in all cases. One of our large state universities is now conducting a series of experiments that seem to indicate for certain types of basic instruction, such as are given by a junior college or in the first

two years of our ordinary university, that mass education is as good as, if not better than, small classes. Educational authorities agree generally that for many types of teaching, research activities are likely to be detrimental to the average teacher. There is no place in the teaching profession for the man who considers teaching a drudgery, and no real teacher needs to have his appetite whetted by a constant or periodic dosage of research. It is true that the subject matter in many of the forestry courses is still very imperfect, and that a teacher of investigative turn of mind may do considerable to improve the content of those courses. Still, an alert teacher will be doing his share if he adopts the results of others and applies himself strictly to the business at hand—teaching.

It is unfortunately true that usually an ". . . . institution . . . . cannot attain a position in the first rank of excellence" which does not carry on research, because educational excellency, even in the graduate school, is measured too largely by the numerical sum of the degrees dangling to the names of its staff and upon the mass of writing that they produce. Of course, the more mature and further advanced the student, the less the need of a teacher and the more the need of professors who are exploring the fringe of the unknown in their respective fields. It can be seriously questioned, however, just how important these research types are to the immature high school type of minds that now predominate in our undergraduate universities. The excellency of such universities should be measured by the product produced and not by the teacher, just one of the factors involved in the process.

The largest number of professional foresters now are and always will be in executive positions. Today, four years of college training seems to be sufficient for many of the positions of this character, and much more can be expected from four such years in the future as more efficient educational methods reduce the time necessary to arrive at any point on the ladder of learning. Generally, the executive forester will find that graduate work in the school of experience is of more value to him than formal work for an advanced degree. If he feels that he must continue his work in an institution, far better usually to browse around in other fields of knowledge than to specialize on some particular subject. Professional foresters desirous of executive positions should be willing to start at a salary of $1800 or even less, realizing that they have yet to demonstrate their practical worth. However, it is to be hoped that they can soon establish that worth to such an extent that some of them will be securing remunerations of $15,000 or more, that will serve as a dollar and cents incentive and guide, which is now so seriously lacking.

All professional foresters, whether they intend to go into executive positions or not, should have at least six months of actual practical woods experience exclusive of formal summer camps. It would seem that many of our undergraduate institutions are not fulfilling their obligations toward their students if they allow them to leave with, as Montaigne aptly put it, "a meere bookish sufficiencie." Such a requirement can be met by two summer vacations and should be made a prerequisite for the bachelor's degree. Let the stu-

dent join a trail crew or work as a fire guard for a summer; let him feel the back work of forestry and let him see it at its worst. If he is discouraged and changes his course of study, nine times out of ten both he and the profession will gain thereby.

Finally, we come to the graduate school, the present haven of too many of the best and some of the worst products of the undergraduate school. Today most of these men are pointed toward research or teaching. Why? Simply because these positions are paying best just now, and not because of any peculiar fitness for the work. Some of the men enrolled are eminently more suited for executive positions, many of which require just as high a caliber of ability. Unfortunately, too, here and there one finds driftwood, students who because of mental limitations or other adverse characteristics, do not seem to fit anywhere; they try this and that, and some of them eventually drift back to college for advanced work.

Such situations can be largely obviated by guarding the graduate degrees more zealously and not presenting them to all who succeeded in inveigling a university into granting them a bachelor's degree and then spend from one to three additional years on the college campus in thought and social opulence. True research positions in forestry are limited and will become more so as forest research advances. Most highly specialized investigative problems can be handled more effectively by those trained in pure science. Obviously, only the very best men who have the requisite research ability should continue their studies as far as the doctorate. Obviously, too, the small number of men needed and qualified for the Doctor of Philosophy degree, can be trained in three or four forest schools, and therefore it is not necessary nor desirable that all forest schools should offer such advanced work. Many schools began to offer work toward a Master's degree before they were well qualified to do so; let us hope that the mistake is not repeated.

Full fledged forest research men should usually possess not only their advanced research training but also sufficient practical experience to be able to envisage the limitations of any conclusions they may later arrive at in the course of their experimentations. It is not amiss to suggest here that candidates for the doctorate should actually possess the reading knowledge of the technical foreign languages that they are supposed to have. When it comes time to pass off their language requirements, some of these studious aspirants for the learned advanced degree indulge in a spasm of cramming that would put an undergraduate to shame. Of course, no language can be learned or retained in this manner. It would seem that research to secure the high type of men desired and not depend on the altruistic motive of service, should pay from $2000 to $15,000 per year.

Forestry teachers, the very best that the profession can produce, should in time receive a remuneration even greater, from $2400 to $20,000. The professor in the undergraduate school will usually find it desirable to have an advanced degree, although this should not be an absolute necessity, whereas practical forestry training and a knowledge of pedagogy should be. On the other hand, the professor in the graduate school should possess a Doctor of Phil-

osophy degree or its equivalent, and should have majored in his specialty. Five years of practical forestry training, preferably before entering upon their advanced study, should be the minimum field experience qualification for all those expecting to make teaching their life work. Of course, such ideal qualifications are still impossible, but even now there seems little excuse for offering teaching positions to men without the practical experience and some advanced study.

Of course, all the foregoing is just a point of view. Such a study as is suggested in Graves' article would do much to substantiate or reject this and other points in dispute.

# CALCIUM—THE KEY TO FOREST PRODUCTIVITY

By GEO. S. PERRY

*Professor of Forestry, Pennsylvania State Forest School*

IN 1907 a large concrete reservoir and warming basin was constructed on a wooded slope of the School Forest at Mont Alto, Pa. It was built to supply water under proper pressure and temperature conditions to the forest nursery, which lay below. It was fed by a four-inch pipe leading down from a splendid spring a mile or more back up the mountain valley. The water is noted for its purity, as the hard sand and quartzite strata of the region are extremely resistant to weathering and solution. Tests show this water, as delivered at the reservoir, to be lower than some distilled water in mineral and organic content, heaving only 16 parts total solids per 1,000,000 (1a).[1]

The reservoir, due to construction defects, with expansion and contraction, has always leaked more or less. In addition, during the growing season and earlier in spring when nursery seeding required water, there has been a large and fairly uniform overflow. This overflow water has served over the past 20-year period to irrigate an acre or more of forest lying below the reservoir. This irrigated area is divided by a contour road which leaves about one-third acre of very uniform soil above, with similar unirrigated areas on both sides, sloping toward the northwest at an angle of 8% to 10%. Perceptible ridges about 30 feet wide, on which no trees were investigated, separate the irrigated and unirrigated areas.

The slope has a coarse to medium open sandy soil almost paved at the surface with angular quartzite rocks. It becomes quite dry in summer, as shown by the tree and shrub species present, since it is exposed to the full drying effect of the west winds which sweep across or along the Cumberland Valley.

It was only natural to expect that under site conditions as above set forth, irrigated trees should show considerably better growth than similar nearby unirrigated ones. We have always explained the much greater forest productivity of our mountain valley and cove soils as compared to adjacent slopes and ridges by the better moisture conditions that are known to exist at lower elevations. Soil moisture always and obviously seemed to be the limiting factor of forest growth. The firmest silvicultural foundations therefore seemed to tremble when the writer took his increment borer in hand and went upon the described area to demonstrate the supreme importance of water, but found data as summarized in Table I.

The forest stand on the areas studied is irregular due to windfall, chestnut bark disease, and selection cutting, but trees are thrifty and openings are full of young growth. The irregularity makes it more difficult to compare increment. Inspection shows that the stand is somewhat more open on the irrigated than on the unirrigated areas. All irrigated dominant and codominant trees of good form were investigated, except one or two white oak and tulip trees with

[1] See "References" at the end of this article.

TABLE I

BREAST-HIGH RADIAL GROWTH OF IRRIGATED AND UNIRRIGATED TREES

| D. B. H. (in.) | Irrigated | | Unirrigated | |
|---|---|---|---|---|
| | Number of trees & crown classes | Aver. of rings per last radial inch | Number of trees & crown classes | Aver. of rings per last rad. inch |
| | | *White Pine* | | |
| 4″-7″ | 7 (6-Cd, 1-D) | 7.33 | 3 (2-Int, 1-Cd) | 6.03 |
| | | *Shortleaf and Pitch Pines* | | |
| 9″ & 10″ | 3 (2-Cd, 1-D) | 21.83 | 4 (3-Cd, 1-D) | 22.62 |
| 11″ & Over | 9 (1-Cd, 8-D) | 17.71 | 8 (5-Cd, 3-D) | 17.12 |
| | | *Jersey Scrub Pine* | | |
| 4″ & 5″ | 9 (8-Cd, 1-D) | 7.07 | 5 (1-Int, 4-Cd) | 9.42 |
| 6″ & 7″ | 3 (2-Cd, 1-D) | 7.57 | 2 (1-Cd, 1-D) | 8.75 |
| 13″ & 15″ | 1 (D) | 12.30 | 1 (D) | 16.00 |
| | | *Black Oak (Q. velutina)* | | |
| 4″ | 6 (6-Cd) | 9.08 | 3 (1-Int, 2-Cd) | 11.53 |
| 5″ | 5 (5-Cd) | 9.86 | 6 (2-Int, 4-Cd) | 8.78 |
| 6″-8″ | 3 (3-Cd) | 11.30 | 4 (1-Int, 3-Cd) | 7.40 |
| | | *All Species* | | |
| | 46 (33-Cd, 13-D) | 11.14 | 36 (7-Int, 23-Cd, 6-D) | 12.31 |

Mean D. B. H. of sample trees=irrigated, 7.27 in.; unirrigated, 8.03 in.

which no comparisons were possible from adjacent unirrigated land. The unirrigated trees were taken from two bands one hundred feet or less in width on both sides of the watered area and separated therefrom by strips on which it was doubtful whether or not the trees had received the benefit of artificial watering. All trees were bored on the south side, which was in general the tension side of the bole due to the prevalent west and southwest winds.

It is seen from the table that while the unwatered trees required, on the average, a little more than one year in excess of the watered, to put on an inch of radius, yet the latter enjoyed considerably better crown and light conditions and were also on the average ¾-inch lower in D. B. H. This serves to make the slightly better growth of the watered trees utterly insignificant. The data are necessarily meagre because of other factors met in attempting to expand them, but they seem irrefutable and at first disappointed and surprised the writer. What is, then, the explanation of the failure of water to induce more vigorous growth in this instance, while everywhere else in nature its effects seem plain to all?

An explanatory theory has been worked up on the basis of observation and study, which, it is believed, is in harmony with the best proven precepts of forestry and soils. Its accuracy and general acceptance in practice should mean greatly increased forest productivity in all humid regions, especially as concerns upper slope and ridge land.

Hilgard, in "Soils of the U. S." (6), took some 1300 analyses of soils from different states and compared them on the basis of aridity or humidity of the climates under which they had been formed. Arid soils are those through which there is practically no percolation, as precipitation does not much, if at all, exceed evaporation and transpiration. In humid regions precipitation exceeds evaporation, so percolation and surface run-off play an important rôle in soil formation.

The fertility of arid soils under irrigation has long been remarked and the effect of absence of leaching, in accounting for this fertility, is notably illustrated in Table II. However, the chief point to this argument is the status of calcium and its related element magnesium, which functions in many ways like lime. It is seen that in arid soils, with more or less complete absence of leaching, mineral plant foods usually occur in 2 or 3 times as great quantity as they are found in the more or less leached humid ones. But calcium is 11 times and magnesium about 4½ times as abundant in the unleached arid soils.

TABLE II

AVERAGE CONTENT OF U. S. SOILS IN RESPECT TO IMPORTANT MINERAL ELEMENTS (AFTER HILGARD)

| | Humid soils | Arid soils |
|---|---|---|
| Potassium ($K_2O$) | .21% | .62% |
| Sodium ($Na_2O$) | .14 | .35 |
| Calcium (CaO) | .13 | 1.43 |
| Magnesium (MgO) | .29 | 1.27 |
| Iron ($Fe_2O_3$) | 3.88 | 5.48 |
| Alumina ($Al_2O_3$) | 3.66 | 7.21 |

Differences set forth in this table are the cumulative results of centuries, even though the analyses were run generally on agricultural or unforested soils. On cultivated or bare lands, it is logical to think lime should be retained better than potash or sodium, due to the ability of the calcium ion to replace ammonium, potassium, and similar base-forming cations in the adsorbed mantle of moisture which surrounds each soil particle (8). This replacement action of lime in farm soils has long been well understood. In this way liming the soil puts ammonium, nitrogen, and potassium in solution in the capillary soil water so that it is available to plants and liable to be carried away in drainage water if not readsorbed or combined in colloidal zeolitic compounds. This action, together with the speeding up of organic decomposition, gave rise to the expression that "lime will burn the fertility out of the soil" and "liming makes a wealthy father but a poor son."

In forest soils, however, carbon dioxide is very potent since it is liberated in quantity by the decay of litter, and has an especial affinity for calcium. Most of the humid soils, whose analyses are listed by Hilgard, undoubtedly were formed under forest cover. This probably explains why lime has seemingly been leached to a far greater extent than potash and other elements, and why all soils on upper slopes and ridges in regions with a rainfall of 25 inches or more per year tend to become more and more acid, while lower slopes and bottoms usually show little change unless they are highly permeable. It explains why bogs and lakes are not very acid unless nearby acid-forming vegetation or minerals influence them. Marly deposits often occur in lakes and marshes whose drainage basins contain no calcareous rocks.

It is therefore submitted that the leaching of plant food elements, *primarily calcium,* from upper slopes and ridges explains the greater forest growth on lower slopes and bottoms where the dissolved material is precipitated and adsorbed in part, and to which a new supply is being brought whenever heavy rains occur or the snows of winter melt.

Gravitational water is only advantageous in so far as it (1) transports soluble food to the tree, and (2), by reason of the more steady moisture supply to the roots, permits the leaf stomata to remain open longer in hot dry weather than they otherwise might; thereby favoring greater carbon dioxide (9 and 12) assimilation and elaboration of carbohydrates. By its tendency to leach under all conditions, it is a menace. For this reason the trees under irrigation with purest spring water derived no net advantage from it.

The importance of capillary raised water to the thrift of forests at lower elevations has been stressed (11), but is of very minor import in forest soils. It has been shown in agriculture, at the Rothamsted plots, England, that when water gets 20 inches below the soil surface, capillarity can never bring it up again; also that the average quantity of water raised from the water table over a period of 34 years would be insufficient to increase the wheat crop one-half bushel per acre (3). On coarse forest soils, in spite of the effect of the humus cover, capillarity probably exerts only a trivial influence upon wood production.

But why is calcium more important than potassium, phosphorus, or other plant food elements? It occurs universally and except in peat soils rarely if ever falls below 1 part in 1000 by weight, which means at least 4000 pounds per acre in the upper foot of mineral earth. In European forestry, studies show that the average woods crop needs less than 11 pounds of lime (CaO) per acre per year if wood only is harvested, while when litter also is removed 62 pounds per acre per year are lost to the soil. Leaching of lime at Rothamsted (2) in England was 800 to 1100 pounds per acre per year for cultivated soils. For Swedish forest soils it has been found that annual leaching of lime may vary from 450 to 900 pounds per acre per year (10). From these data it is apparent that loss of lime by leaching may be many times that used by the growing trees. Study of this and associated phenomena for forest soils of the eastern United States is badly needed.

The following statements will help direct attention to the absolute importance of calcium to forest growth:

(1) Lime is a necessary component of the nucleus of every plant cell and chloroplast.

(2) It is a sort of soil catalytic agent that speeds up growth and decomposition processes (8). The heavy content of lime in leaves and twigs of trees illustrates the calcium cycle which can never be interrupted without disaster to forest increment. Litter decomposes and liberates lime in a form highly essential to all soil organisms and greedily reabsorbed by tree roots, to be deposited finally for the most part in leaves and bark of twigs, after playing its rôle in the sap circulation and cell building of the tree.

(3) The recent forest soil studies of Dr. Hesselman (4 and 5) show that the content of assimilable lime in forest soils is almost directly proportionate to the

rate of nitrification, thrift of tree growth, and ease of natural seed regeneration on the sites investigated. Aaltonen and Cajander in Finland (1 and 1b) support this same conclusion.

(4) During the past summer the writer observed in southern Mississippi, Alabama, and Louisiana that a marked difference in farm and forest productivity exists between the first or lower bottoms and the "second bottoms"—bench or hammock land. These latter areas while often only a few feet higher than the lower "first bottoms" have probably not been subject to overflow for centuries while the lower bottoms have. As a result the "second bottoms" are usually leached so badly as to be highly acid and very low in lime content. Water has carried lime to the first bottoms; hence their productivity. Longleaf pine (7) is a calcifuge species that can never in nature withstand the early ravages of damping-off fungi and hence is excluded from fertile bottoms. When planted on fertile sites, as a seedling, or if given lime-carrying fertilizers, it thrives amazingly, bearing leaves up to 25 inches long.

(5) Most calcifuge species are only such because of inability to resist during their first weeks of life the damping-off organisms, which thrive exceedingly in soils rich in lime. Twenty years of forest nursery experience have shown the writer repeatedly that wood ashes, raw bone meal, or lime in any form, applied to seed beds before germination, will multiply damping-off losses many fold, especially for such species as red pine (*P. resinosa*), pitch pine (*P. rigida*), shortleaf pine (*P. echinata*), white pine (*P. strobus*), hemlock (*Tsuga* sp.), larches (*Larix* sp.), and tulip poplar (*L. tulipifera*). Yet of all plantations of such species made in the locality of the Pennsylvania State Forest School, those located near Marion in Franklin County amid the limestone outcrops of the Cumberland Valley are uniformly best. It is doubtful, however, if these trees can reproduce themselves on such a soil.

(6) A suitable lime content in soils gives rise to compound particles or crumb-structure. Favorable physical condition is more important to forest growth than chemical composition or any other soil factor within ordinary limits. An examination was made recently in the mixed forest plantations at Pond Bank on the School Forest. Upon removing the scanty litter from beneath the larch trees there, the soil was found to be granular and mellow, while nearby beneath white pine and other coniferous species it was compact, tough, and sharply distinct from the needle litter that lay upon it. Larch litter is notably rich in lime while that of other conifers is very deficient.

What does it signify to forestry, if lime is the key, or limiting factor, to forest productivity? Liming forest soils is unthought of and would be futile because of rapid loss by leaching and uncertainty as to whether calcium carbonate is directly responsible for the stimulus trees get from decomposition of organic matter rich in lime. It has even been suggested that organic calcium compounds react upon the forest by favoring desirable mycotrophic life in the soil; hence the benefits of lime in the forest must be secured by good silvicultural management, which will mean increase in the quantity of calcium organically combined.

## Conclusions

1. If available lime is the key to forest production, it should be possible to grow good forests nearly everywhere in the humid eastern United States, since soil moisture becomes a secondary matter.

2. To get full benefit of the lime liberated continuously by weathering and soil building agencies, it is merely necessary to limit leaching to its absolute minimum by (a) complete forest fire prevention, (b) practicing selection forestry and never clearcutting, (c) putting the "lime pumpers" to work on every area. By this last phrase is meant growing on every acre considerable numbers of those trees whose leaf-fall is relatively rich in lime, and thereby capable of keeping a large quantity of calcium in circulation and combined in the humus cover.

We lack reliable information as to which are the best "lime pumping" trees in the forests of the United States, but there is doubtless great variation. Beech, birches, aspen, elms, larch, and oaks are all now recognized in European forests as lime conservers. All trees and shrubs in the heath family (*Ericaceae*), together with the sphagnum mosses and some other less important groups, are classed as acid-formers. These species are really calcifuge. It has been observed that when birch trees grow so that their leaves blow into sphagnum pockets, these mosses begin to decline in vigor and give way to other more lime-tolerant plants. On the Mont Alto School Forest, the chestnut bark disease may prove an ultimate blessing, for the reason that the rock, red, and black oaks, tulip poplar, black birch, and white ash that have taken over much of the space once held by chestnut surpass it greatly in quality of their litter by reason of its higher lime content. It is already noticeable in many places where *Kalmia, Vaccinium, Gaylussacia,* and related species once held sway, that these have nearly disappeared and that the forest litter decays more readily than was the case when acid chestnut leaves were its dominant component. This certainly bodes well for future productivity.

## References

1. Aaltonen, V. T., "Aziditätsgrad des Waldbodens," 1925 Report of Finnish Forest Research Institute, Helsinki, page 5.

1a. Auten, J. T., Unpublished lectures on "Forest Soils," Penna. State Forest School, 1924, *et seq.*

1b. Cajander, A. K., "Die Verteilung des fruchbaren Bodens in Finnland," Vorträge über die Waldwirtschaft und Forstwissenschaft in Finnland, Helsinki, 1925, pages 47 and 48.

2. Hall, A. D., "Effect of Plant Growth and Manures on Retention of Bases by the Soil," Proc. Royal Soc., 1905, vol. 77, pages 1-32.

3. ———, "Rothamsted Experiments," page 23.

4. Hesselman, Henrik, "Humus Layers of Coniferous Forests," translated from German Résumé of "Barrskogens Humustäcke" in 1925 Report of Swedish Forest Research Station by P. R. Gast, N. E. Forest Experiment Station, pages 28-33.

5. ———, "Kvävemobiliseringen och Barrträdplantans Utveckling," 1927 Report of Swedish Forest Research Station, pages 338-432.

6. Hilgard, E. H., "Soils of the U. S. A.," 1918, page 377.

7. Ness, H., "Distribution of Longleaf Pine and Its Possible Extension," Journal of Forestry, Nov. 1927, pages 852-858.

8. Oden, Sven, collaborating with O. Arrhenius, "Jordens Surhetsgrad, Buffertverkan och Kalkbehov," Stockholm, 1927, pages 72-76.

9. Stålfelt, M. G., "Sol- och Skogbladens Kolhydratsproduktion," 1921 Report of Swedish Forest Research Station, page 185.

10. Tamm, O., "Die Auslaugung von Calciumkarbonat im Ragundagegen," Geolog. Föreningens Förhandling, 1914, (36), pages 219-266.

11. Toumey, J. W., "Foundations of Silviculture," Part I, 1924, page 81.

12. Weber, Friedl., "Zur Physiologie der Spaltöffnungsbewegung," 1923 Österreichs Bot. Zeitschrift 72, page 43.

# HASTENING THE GERMINATION OF SOUTHERN PINE SEEDS

By LELA V. BARTON

*Assistant in Plant Physiology, Boyce Thompson Institute for Plant Research, Inc.*

FOR many years delay in germination of pine seeds has presented a difficult problem. As a result there have been attempts to find methods for breaking the rest period and promoting immediate germination.

Jacobs (1) found that soaking for four days in tap water and exposure to freezing for 48 hours are most favorable to induce the early and complete sprouting of sugar pine seeds. The beneficial action of soaking he attributed to the action of bacteria. He added that the whole problem of hastening the sprouting of sugar pine seeds seems to be the existence of the rest period.

Tozawa (5), working on *Pinus koraiensis,* treated the seeds with concentrated sulfuric acid. He also soaked them in warm water. He reported poor results. His best results were obtained from "burying storage." Freshly harvested seeds were put in moist sand in a box screened above and below and placed in the ground with the top of the box level with the surface. He used "exposed burying storage" and "protected burying storage." For the latter method, which is ordinary stratification, he reported a favorable effect but "exposed burying storage" yielded better results. This, he said, was due to the fact that the seeds in storage were exposed to the full influences of the season from the moment they were extracted from the cones.

Lipkin (3) reported that in the course of a month with an average temperature of —9.5° C. *Pinus sylvestris* showed an increase in germination capacity. A corresponding increase was shown by the same seeds when they were put at —2° C. after having soaked for 24 hours.

According to Larsen (2), the delayed germination of western white pine seed is not caused by any inherent physiological characteristic of the seed embryo or endosperm such as after-ripening or the need for a period of rest, but by the impermeability of the seed coat, and prompt germination may be obtained from fresh seed by any of the following methods: 1. Reduction of seed coat by chemical corrosion, preferably by immersion for 45 minutes in concentrated sulfuric acid with thorough rinsing. 2. Reduction of seed coat by mechanical abrasion or pearling process in such a manner that the seed is not cracked or subjected to much pressure. 3. Soaking the seed in water for 24 hours and exposing it to air freezing in winter for at least 40 days. 4. Burying the seed in moist bark-free sawdust and maintaining it at a relatively warm temperature for three weeks followed by immediate sowing.

He added, however, that in the absence of preliminary treatment, good germination may result from late fall sowing of good, newly collected seed.

Wahlenberg (6) found that fall sowing of western white pine seed resulted in prompt and complete germination the following spring. Regular and full stands of seedlings were thus secured.

On the other hand, spring sowing of western yellow pine is considered a safer practice than fall sowing (Wahlenberg (7)).

It is probable that fall sowing serves for stratification at a low temperature.

The present paper reports experiments on the hastening of germination of seeds of shortleaf pine (*Pinus echinata*), longleaf pine (*Pinus palustris*), slash pine (*Pinus caribaea*), and loblolly pine (*Pinus taeda*).

Preliminary to storage experiments which are now in progress, germination tests of these pine seeds were made. These tests revealed a very slow and incomplete production of seedlings.

In an effort to induce prompt and complete seed germination, the possibility of the favorable effect of stratification at low temperature was made the basis for investigation. Prompt and complete germination is desirable for several reasons:

1. It insures a regular full stand of seedlings.
2. It prevents or greatly decreases weed growth.
3. It gives a covering early in the spring so that the sun will not heat the ground and kill the seedlings at the soil surface.
4. It requires a smaller quantity of seeds for sowing.
5. It gives seedlings of uniform character.
6. It avoids the necessity for holding beds over until the second season.

Stratification of these seeds at a low temperature for one to four months previous to planting has been found to hasten greatly their germination.

## Method

Embryo tests of 500 seeds of each species were made by breaking the seed coats and examining the condition of the endosperm and embryo. Those embryos which were shrunken or moldy were classified as "bad" embryos. Seeds which were empty were so designated.

The method of procedure in stratification consisted in mixing the seeds with moist acid peat enclosed in cheesecloth bags and putting these into the compartments of large partitioned aluminium trays. These trays are in general use at the Boyce Thompson Institute for Plant Research for stratifying seeds, and have their main value in conserving space and making very accessible any samples of seed so stratified. The trays were then placed in constant temperature ovens. The stratification temperatures used were 0, 5, 10, and 15° C. Five hundred seeds of each species were placed at each temperature. The peat was kept moist during the stratification period by frequent waterings.

At the end of one month 100 seeds of each species were removed from the peat and planted in flats containing two-thirds sand and one-third wood soil, in a greenhouse which had an average temperature of about 69° F. This temperature was higher for subsequent plantings. The plantings were repeated at the end of two, three, and four months.

Each time seeds which had been stored in paper bags at room temperature were planted for controls. In two cases samples were planted outside. The depth of covering of the seeds was about

one-fourth to one-half inch (Rubner (4)).

Thanks are due Mr. Nathan D. Canterbury, Assistant Superintendent of Forestry, State Department of Conservation, New Orleans, Louisiana, who furnished the seeds used. The seeds were collected in the fall of 1927 and were stored in paper bags at room temperature until the present experiments were started in January, 1928.

## Results and Discussion

The results of the embryo tests are given in Table I. It will be noticed that 90 per cent of the longleaf seeds were apparently capable of germination while only 72 per cent of the short leaf seeds had good embryos. Slash and loblolly embryos occupied intermediate positions, 77 and 87 per cent respectively appearing vital.

Apparent germination percentages were calculated on the basis of the number of seeds planted. These percentages appear in the tables and graphs. Calculations of "real" percentages (Jacobs (1)) were also made on the basis of the number of good embryos as revealed by the tests described above.

Since the best stratification temperature was not known, 500 seeds of each species were stratified at each of the following temperatures: 0, 5, 10, and 15° C. The final results of germination tests from seeds stratified for one and two months at each temperature are given in Table II.

From this table it will be seen that 5° C. can be considered as good an after-ripening temperature as any used. Except for the longleaf pine, however, all species studied showed marked improvement after stratification at any of the temperatures tried. From the practical point of view this wide range of favorable temperatures is important for it eliminates the necessity for any *one* temperature.

Longleaf pine, which germinates quite easily without stratification, shows a slight preference for 0° C. for either one or two months' stratification. Seeds of this species stratified at 10° and 15° C. were not planted in the greenhouse because of the fact that germination had occurred in the moist peat before the end of the first month of stratification (54 per cent germination at 10° C. and 77 per cent germination at 15° C.). At 5° C. the longleaf pine germinated (90 per cent) before the end of the second month's stratification so that more plantings were impracticable.

From Table III [1] and Figures 1, 2, 3, 4, and 5 the beneficial effect of stratification is evident. Results from 5° C. stratification only were used in order to simplify tables and graphs. Since seeds from paper bags in the laboratory were planted as controls for each lot of stratified seeds used, the figures for controls in the tables and graphs represent averages of all the germination records from the individual controls. The graphs show very clearly the slow and incomplete growth in these cases. This means the production of irregular and incomplete stands of seedlings.

On the other hand, stratified seeds germinated promptly and completely, thus securing a regular and full stand

[1] The data for Tables II and III are from two different experiments, which accounts for the variation in percentage germination of the various species in the two tables.

TABLE I

RESULTS OF EMBRYO TESTS ON PINE SEEDS. 500 SEEDS OF EACH SPECIES EXAMINED

| Species | Bad embryos Number | No embryos Number | Total bad and no embryos Number | Per cent of good embryos |
|---|---|---|---|---|
| Shortleaf | 13 | 129 | 142 | 71.6 |
| Slash | 16 | 101 | 117 | 76.6 |
| Loblolly | 10 | 53 | 63 | 87.4 |
| Longleaf | 35 | 14 | 49 | 90.2 |

TABLE II

FINAL GERMINATION PERCENTAGES AND TIMES OF PINE SEEDS AFTER STRATIFICATION AT DIFFERENT TEMPERATURES FOR ONE AND TWO MONTHS

| Species | Months of stratification | 0° C. | | 5° C. | | 10° C. | | 15° C. | |
|---|---|---|---|---|---|---|---|---|---|
| | | % | Days | % | Days | % | Days | % | Days |
| Shortleaf | 1 | 66 | 25 | 59 | 20 | 53 | 20 | 48 | 25 |
| | 2 | 56 | 13 | 63 | 14 | 43 | 13 | 52 | 14 |
| Slash | 1 | 61 | 25 | 74 | 20 | 70 | 18 | 57 | 30 |
| | 2 | 68 | 13 | 72 | 14 | 63 | 13 | 56 | 14 |
| Loblolly | 1 | 75 | 30 | 82 | 23 | 74 | 27 | 79 | 25 |
| | 2 | 68 | 14 | 79 | 14 | 83 | 13 | 61 | 14 |
| Longleaf | 1 | 85 | 20 | 77 | 25 | .. | .. | .. | .. |
| | 2 | 82 | 13 | .. | .. | .. | .. | .. | .. |

## Table III

GERMINATION PERCENTAGES AFTER STRATIFICATION AT 5° C. FOR ONE, TWO, THREE, AND FOUR MONTHS. PERCENTAGES GIVEN AT TWO-DAY INTERVALS UP TO 30TH DAY AFTER WHICH THE INTERVALS ARE TEN DAYS. GERMINATION VALUES ARE FOR 100 SEEDS. CONTROLS ARE AVERAGES OF SEPARATE CONTROLS FOR EACH STRATIFICATION PERIOD

| Species | Months of stratification | Number of days | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| | | Germination percent | | | | | | | | | | | | | | | | | | | | | |
| Shortleaf | 1 | .. | .. | .. | .. | 20 | 43 | 52 | 58 | .. | 59 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 2 | .. | .. | .. | 14 | 52 | 71 | 79 | 80 | 84 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 3 | .. | .. | .. | 58 | 74 | 75 | 78 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 4 | .. | .. | 21 | 61 | 68 | 71 | .. | 72 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | control | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | 4 | 5 | 8 | 12 | 14 | 20 | 31 | 41 | 46 | 52 | 54 | 57 | .. |
| Slash | | .. | .. | .. | 3 | 44 | 63 | 67 | 72 | .. | 74 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 2 | .. | .. | .. | 16 | 51 | 65 | 70 | 72 | 76 | 78 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 3 | .. | .. | .. | 58 | 67 | 77 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 4 | .. | .. | 7 | 50 | 73 | 77 | 78 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | control | .. | .. | .. | .. | .. | 1 | 3 | 4 | .. | .. | .. | 5 | 9 | 10 | .. | 13 | 16 | 19 | 24 | 28 | 35 | 37 |
| Loblolly | 1 | .. | .. | .. | .. | 4 | 44 | 58 | 75 | 76 | 79 | 82 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 2 | .. | .. | .. | 2 | 42 | 45 | 60 | 67 | 75 | 83 | .. | 84 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 3 | .. | .. | .. | 52 | 69 | 83 | 84 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 4 | .. | .. | 1 | 60 | 87 | 89 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | control | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 3 | 4 | 6 | 10 | 15 | 20 | 25 | 29 | 33 | 37 | 41 |
| Longleaf | 1 | .. | 5 | 37 | 58 | 73 | 75 | .. | .. | 76 | .. | .. | .. | 77 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | control | .. | .. | .. | .. | 9 | 26 | 43 | 50 | 53 | 56 | .. | 63 | 71 | .. | 74 | 75 | .. | .. | .. | .. | .. | .. |

of seedlings. This contrast is less marked for longleaf pine than for the other three species. In all cases, however, prompt and complete germination followed stratification. For example, loblolly pine seeds (Figure 3), planted without after-ripening, have 41 per cent germination in 100 days, while with a one month after-ripening period at 5° C. they have 82 per cent germination in 22 days. The same effects with other species are shown in Figures 1, 2, and 4.

Samples of seeds planted outside on April 20 demonstrated similar advantages of stratification, although the germination process was delayed considerably due to the cool, cloudy weather. Here the first seedlings appeared after 35 days. After 48 days the germination of the after-ripened seeds of shortleaf, slash, and loblolly had reached 62, 60, and 70 per cent respectively, while no control seedlings had appeared above ground at that time. After 69 days, however, germination of control seeds had reached 28 per cent for shortleaf, 1 per cent for slash, and 6 per cent for loblolly. The stratification period in this case was three months.

Other samples of seeds which had received two months' stratification at 0, 5, 10, and 15° C. planted outside June 19 showed results comparable to those in the greenhouse.

"Real" percentages indicated that practically 100 per cent of the good embryos of the stratified seeds produced seedlings. In some cases the "real" percentage was above 100. This is clearly shown in the figures where the dotted lines represent the percentage of good embryos in each case, and may be explained by the variation in the seed lots examined and planted.

It is of special interest to note the effects of different stratification periods on the germination of the seeds. The graphs show that a one-month period yields a high percentage of germination in a comparatively short time. However, as the after-ripening period is lengthened into two, three, and four months, the germination time decreases noticeably. Whether this decrease is of sufficient importance to warrant the expenditure of extra time for after-ripening is a question.

The tardy germination of current year seeds and the very favorable effect of low temperature stratification upon the percentage and promptness of germination suggest that old seeds of these pines may be revived to some extent by such stratification. Certainly in making vitality tests on stored seeds low temperature stratification is desirable previous to germination tests.

For handling seeds on a large scale three places for stratification might be suggested:

1. A large ice box.
2. A cellar with a temperature 15° C. or below.
3. Cold storage.

In any case, the seeds might be mixed with moist peat and put into large rather flat boxes. It would be necessary, of course, to water and aerate the seeds frequently.

Future study in low temperature stratification effects should include seeds of all pines. This may be the best commercial method for obtaining prompt and complete stands of seedlings in many other species.

At present, it is not known whether the pine embryo is dormant. This point will be tested in future experiments.

### SUMMARY.

Stratification effects on longleaf, shortleaf, slash, and loblolly pine seeds were studied in an effort to obtain prompt and complete germination.

Growth records showed that stratification for one or two months at 0, 5, 10, or 15° C., or for one, two, three, or four months at 0 or 5° C. (except longleaf) is of decided benefit in hastening germination and giving a perfect seedling stand. For practical purposes stratification for two months at 5° C. seems desirable except for longleaf which should be stratified for one month at 5° C. or for one or two months at 0° C.

The results of this investigation suggest a possible method for treating pine seeds which fail to germinate after a year and a half storage.

### LITERATURE CITED.

1. Jacobs, A. W., Hastening the germination of sugar pine seeds. Jour. For. 23:919-931, 1925.
2. Larsen, J. A., Methods of stimulating germination of western white pine seeds. Jour. Agr. Res. 31:889-99, 1925.
3. Lipkin, B. J., Der Einfluss niedriger Temperaturen auf die Keimfahigkeit von Waldsamen. Mitt. Gork. Ysch. Landwirtsch. Inst. 2:182-197, 1925.
4. Rubner, K., Bedeckungstiefe und Keimung des Fichtensamens. Forstw. Centralbl. 49/5:168-183, 1927.
5. Tozawa, M., Methods of hastening germination of tree seeds. Bull. For. Exp. Sta. No. 5, Keijyo, Japan, 1926.
6. Wahlenberg, W. G., Fall sowing and delayed germination of western white pine seed. Jour. Agr. Res. 28:1127-1131, 1924.
7. ———, Sowing and planting season for western yellow pine. Jour. Agr. Res. 30:245-251, 1925.

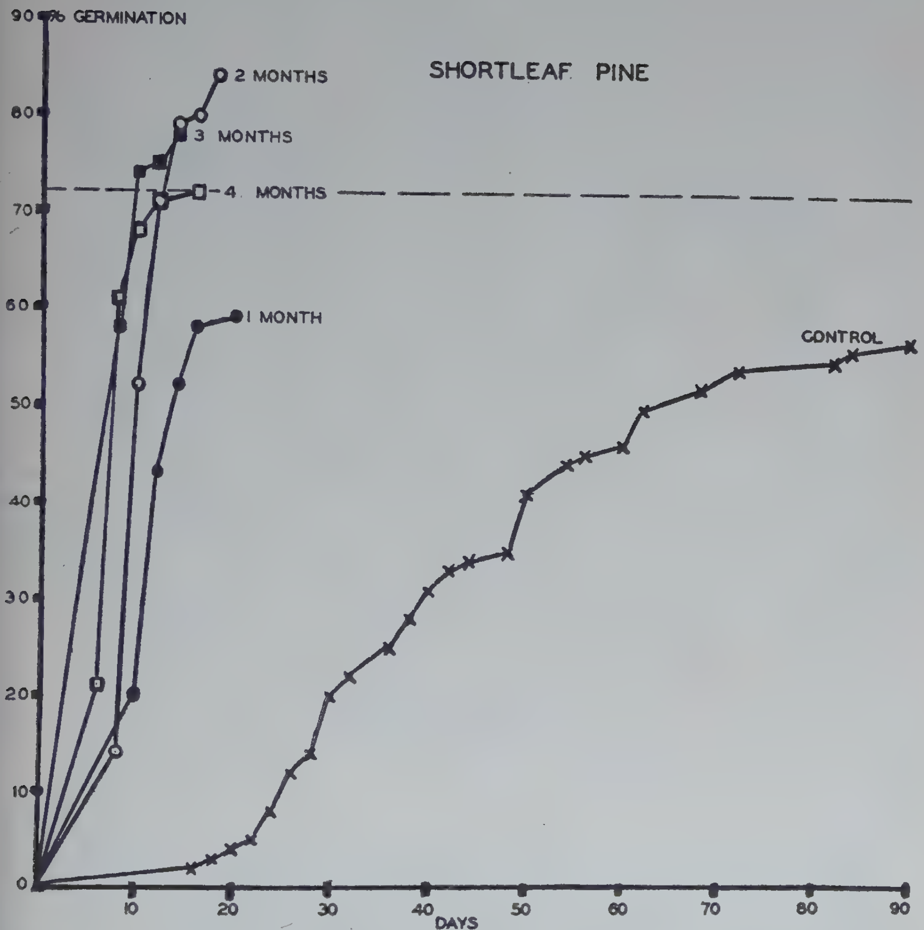


FIG. 1. The effect of stratification at 5° C. for one, two, three, and four months on germination of shortleaf pine seeds. Dotted line shows the percentage of good seeds as revealed by embryo tests.

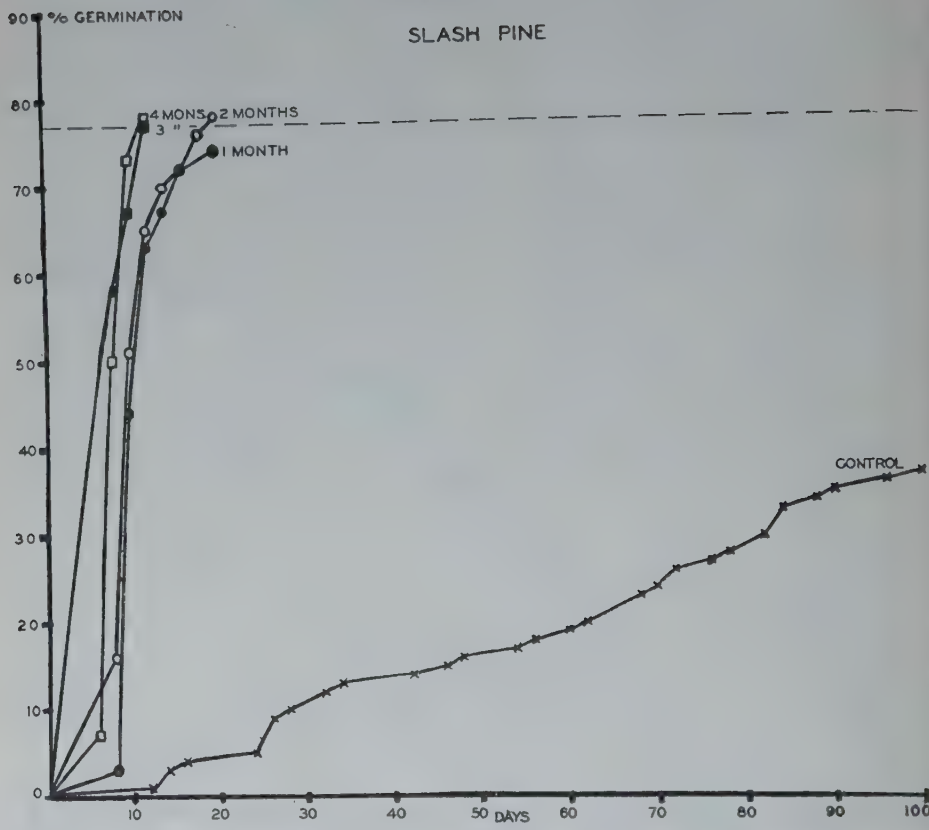


FIG. 2. The effect of stratification at 5° C. for one, two, three, and four months on germination of slash pine seeds. Dotted line shows the percentage of good seeds as revealed by embryo tests.

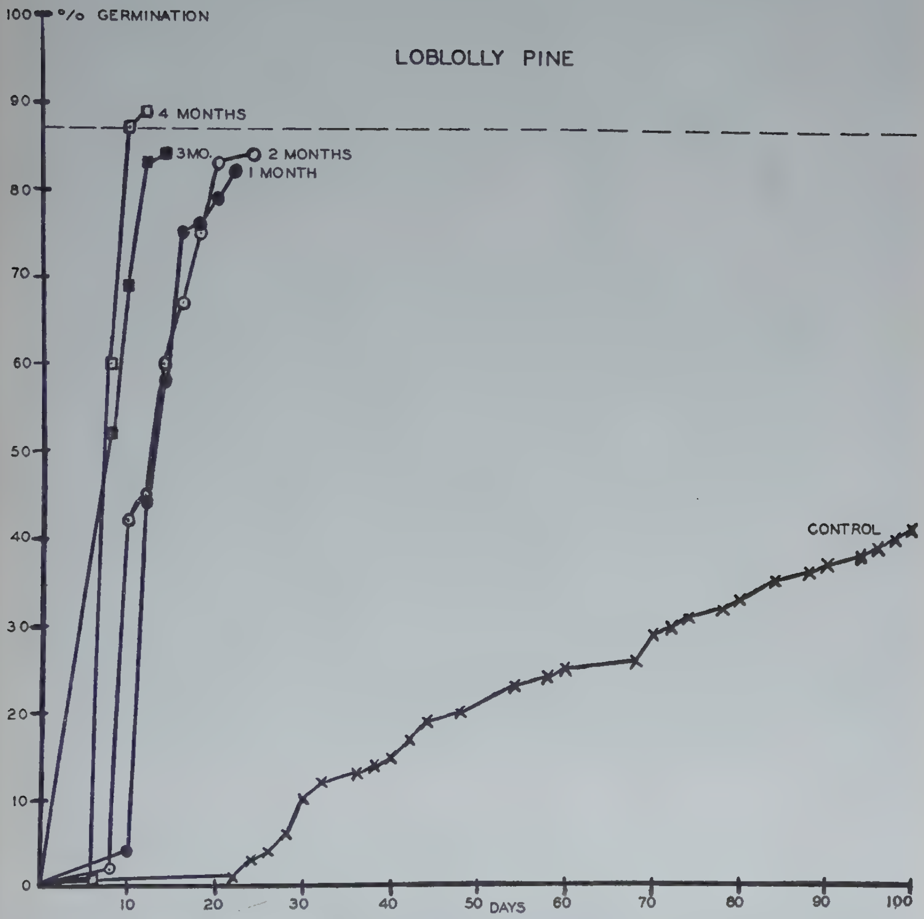


FIG. 3. The effect of stratification at 5° C. for one, two, three, and four months on germination of loblolly pine seeds. Dotted line shows the percentage of good seeds as revealed by embryo tests.

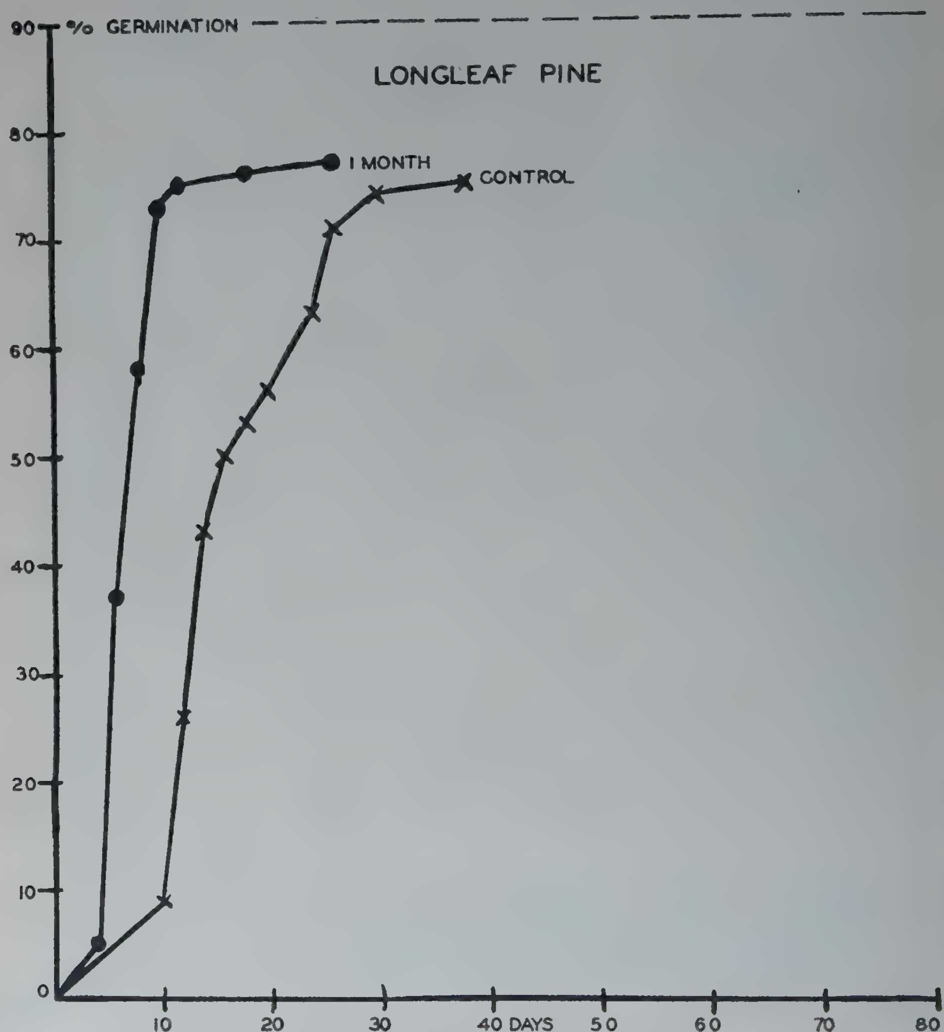


FIG. 4. The effect of stratification at 5° C. for one month on germination of longleaf pine seeds. Dotted line shows the percentage of good seeds as revealed by embryo tests.

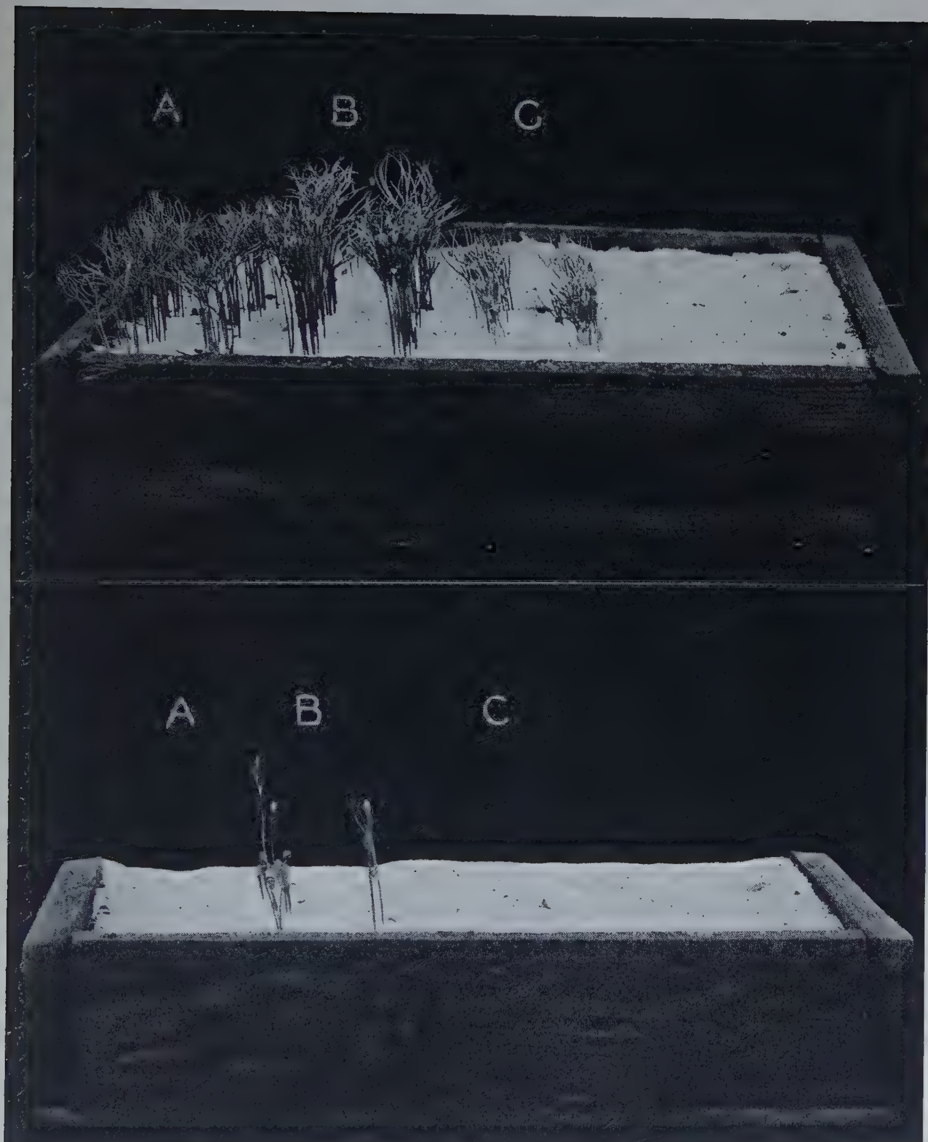


FIG. 5. Above—Stand resulting from seeds of loblolly pine (A), slash pine (B), and shortleaf pine (C), which had been stratified at 5° C. for two months. Picture taken 14 days after planting. Below—Stand resulting from the corresponding controls.

# UNDERSTOCKED STANDS

By W. H. MEYER

*Assistant Silviculturist, Pacific Northwest Forest Experiment Station*

MUCH discussion, but relatively little writing, has been going the rounds in late years regarding the relation between average yields and normal yields, and regarding the question whether understocked forests approach a more normal condition with the passage of time. One of the chief arguments against using normal yield tables is based on the assumption that understocked stands do not maintain the same degree of normality throughout their lives, and it is necessary to know whether or not this question is as important as declared and solvable by short-time studies. D. Bruce, in the January, 1928, issue of the "Forest Worker," very aptly shows that in case of an extensive survey made in Finland the average of current growth and the total volume for all types and age classes when compared to their normal values indicated no evidence of growth toward normality; as a matter of fact the evidence pointed the other way slightly. The illustration supports the feeling which the writer has been cherishing for the past several years, in his study of understocked stands in Douglas fir and in red spruce, that the whole question of growth toward normality has been grossly exaggerated, and that whatever tendencies toward such a trend may exist can be solved satisfactorily only by long-time growth studies, and not by any conceivable short-time methods of manipulations of figures.

If the investigator confines himself strictly to plots on which the trees are evenly spaced, either closely or widely but essentially evenly, then nice relations can be determined between stocking as defined by relative numbers of trees and board-foot volume. For instance, in red spruce in which such a study was possible, curves were drawn showing that with certain degrees of understocking the board-foot volume could be larger than the normal volume; with overstocking it was less. The most favorable condition for maximum board-foot volume was between 60 and 70 percent stocking in respect to total number of trees.

White spruce and balsam fir gave evidences of similar trends. However, when Douglas fir stands were investigated and the plot system of samples was dropped for the tract system and the strip system, it was found after detailed analysis that no faith could be put in number of trees as a basis for judging stocking. The presence of understory, the groups of trees, the damage at various ages by fire and storm, contributed to make this factor almost useless. The average points by themselves might have been taken to mean something or other, but when the dispersion of the samples around the average values (standard error per cent) was examined, the meaning was lost. The data were taken from 5014 chains of strip survey in a number of tracts (83) of even-aged second-growth Douglas fir. Other similar tests were made with

groups of 433 and 118 temporary sample plots, but in no case was the relation definite enough to be used, and in no case did even the average points show a maximum volume with certain degrees of understocking, as did red spruce and its coniferous associates. Off-hand these remarks may not seem pertinent to the subject of this paper, but they are in so far as they show that with some species at least no faith can be put in the argument that if the volume percentage of normality over-runs the number-of-trees percentage, growth towards normality can be deduced.

With number of trees out of consideration as an index of stocking in Douglas fir forests, it follows that no method involving number of trees solely, such as tallying trees estimated to have died within a certain period, of which an example is given later, would give satisfactorily the trend toward normality as it affects volume.

Other methods of estimating trend toward normality are based on analysis of sample trees. Dwight in the JOURNAL OF FORESTRY for April, 1926, outlines a method which seems applicable. That an immense amount of work is required is immediately apparent. Secondly, there is considerable doubt whether the small rates of change in degree of stocking can be correctly determined. On permanent sample plots in second-growth Douglas fir it was found that this trend in understocked forests amounted to approximately 2 per cent in a five-year period. Little accidents, such as occur with windstorms or ground fires, would wipe out entirely the increase in normality. In addition, height curve location alone, in working up sample material could play all sorts of tricks with such a small percentage. The dislocation of the height curve throughout its length could give an error of one per cent for each foot, and it is well known that height measurement of standing trees cannot be relied upon to such fine accuracy. Differences in the form of trees between a wide-spaced and a closely stocked stand, for which no account is made in present practice, can give about one per cent volume error for each difference in single form quotient unit. The average height of the dominants and codominants, which is used as the basis for estimating the actual site index, may be intrinsically different for exactly the same site in a fully stocked and in an understocked stand. The difference is hard to evaluate. If both fully stocked and understocked temporary plots are therefore analyzed for very small differences, this inaccuracy in site determination alone will cause sufficient error to destroy the significance of the computations. If then, these difficulties are present with sample plots, how much more effective would they be if one conjecture were added to another, such as the conjecture of diameter growth added to the conjecture of height, added to the conjecture of mortality, and so forth, as is done when a stand is projected into the future or replaced in the past.

In the Douglas fir region of the Pacific Northwest, there are now 26 sample plots established in second-growth forests. The working plan calls for a total of 45 plots within the next two years. Already some of the plots are fifteen years old. Within a relatively short time, every five years will see 45 new periodic measurements in the files, and the number of samples will soon give a great sufficiency for analysis. Espe-

cially is this true because analysis must be made of plot values in terms of the normal values, that is stocking percentages or normality percentages, which brings all ages and sites to a comparable basis. The outlook for a solution of the problem of the importance of growth toward a normal condition within the next decade is very bright. In other words, the solution should be at hand before any predicted yields become effective.

A few indications of the character of the growth toward normality which have recently come to light may be quickly summed up. On the basis of 22 five-year periods taken on several permanent plots, second-growth Douglas fir gave the following increases in normality in a five-year period irrespective of the original stocking of the stand:

- In total number of trees, 2.8 per cent.
- In total cubic-foot volume, 3.7 per cent.
- In board-foot volume by Scribner rule, —.2 per cent.
- In board-foot volume by International rule for ⅛ inch kerf, 3.7 per cent.
- In total basal area, 2.4 per cent.

If only those measurements of the plots were taken which were below 100 percent stocking, the percentages of increase would change to 3.1, 2.7, 2.0, 6.1, and 4.5 respectively. Individual plots varied greatly, so that the averages as listed are not as good as might be desired. The measurements were altogether too few for a determination of the difference in the rates with variations in the degree of stocking.

Another test based upon a temporary study might be stated. Douglas fir was again the subject. Stocking was based on total number of trees, later found to be so unreliable as an index of volume stocking. On strip surveys totalling 115 acres of actual tally, the trees which had died within the last five years were recorded by total number only and not by diameter. These tallies were applied to the present grade of stocking to obtain a grade of stocking for five years ago. They were averaged by classes of stocking and roughly curved out with the following results:

| Stocking at beginning of period Per cent | Elapsed time Years | Stocking at end of period Per cent |
|---|---|---|
| 40 | 21 | 50 |
| 50 | 23 | 60 |
| 60 | 26 | 70 |
| 70 | 31 | 80 |
| 80 | 39 | 90 |
| 90 | .. | 100 |
| 110 | .. | 100 |
| 120 | 30 | 110 |
| 130 | 18 | 120 |
| 140 | 11 | 130 |

Very roughly, a change of 2 per cent every five years approximated by permanent sample plots is substantiated by this table.

In red spruce a similar trial gave an advance from 40 to 50 per cent stocking in 12 years, 50 to 60 per cent in 15 years, 60 to 70 per cent in 21 years, 70 to 80 per cent in 27 years.

A third instance can be cited. In a second-growth stand of Douglas fir composed of one age and apparently one site class, four permanent sample plots were laid out in 1927, and about 30 borings to a plot were taken with which to determine the age and the relative diameter growth as affected by stocking. By using methods similar to those discussed by Dwight, no satisfactory conclusions could

be reached. The densest plot, with a stocking of 121 per cent of the normal basal area and 136 per cent of the normal number of trees 12 inches D. B. H. and larger (a good index of the normality of board-foot volume by Scribner rule in stands of this age), showed the best diameter growth. The poorest stocked plot, 89 per cent stocking in basal area, or 77 per cent in number of trees 12 inches and larger, had the poorest diameter growth. It probably had not recovered from a ground fire which had run through the stand about 30 years ago. The other two plots lay inconsistently between the two values. In other words, the contention is ably supported that temporary measurements are subject to too much error. In the cited case it even goes so far as to give absolutely contradictory results.

Much more can be said on this subject. The writer does not claim any conclusive results, but merely lists the indications, with the hope that other investigators on the same subject will add their analyses of data and deductions.

# PINE PLANTATIONS AND NEW ENGLAND FORESTRY

By RICHARD T. FISHER

*Director, Harvard Forest*

FORESTRY began to be promoted in New England only a little over a quarter century ago. In that period the federal Forest Service, the several associations, and later as they became established the state departments and forest schools have built up an immense campaign of education. This publicity has largely determined the popular conception of forestry and hence the direction of its growth. Almost from the start and with increasing unanimity the programs and propaganda have been centered on the planting of white pine. For this there were obvious reasons: the abundance of natural old field pine, its rapid growth and ready market, the adaptability of abandoned or failing farms to planting, and, as a question of advertising, the ease with which the setting-out of little trees could be dramatized to the public. Leaving out fire protection (not in itself productive), progress in forestry is more and more commonly measured by the number of seedlings produced, distributed, and planted. Implied by this and often directly expressed is the assumption of vast deforested or waste areas which must be made productive. In consequence it is the common belief, shared by most timberland owners and apparently even by some foresters, that forestry means reforestation, and that reforestation means planting, generally white pine.

It is axiomatic that sufficient wood production is in the long run a regional necessity, and that the right kind of education will help bring it to pass. Furthermore, if forestry is to be a live industry, not only must economic conditions permit timber to show a profit on its cost, but, in Colonel Greeley's expressive phrase, "the people must become forest-minded." In the light of these objectives and now that twenty-five years of silvicultural experience and economic developments have passed, it is timely to inquire whether the widespread emphasis on plantations of pine is a sound policy.

Pure pine stands both in natural woodlots and in plantations are silvically alike. At fifty to sixty years growth falls off rapidly, general health declines, and disease is frequent, especially red rot (*Trametes pini*). The soil tends to become impervious and unfertile under an increasing layer of raw humus and litter. Only low grade or knotty lumber is produced, and this poor quality is aggravated by injuries from the pine weevil, which is particularly damaging in the usual wide-spaced plantation. Blister rust, now widespread, is a matter of serious concern, and whatever may be said for control, the disease has proved most destructive in compact stands. Pure pine is a transition type, and except on the lightest soils reverts to hardwood or mixtures of hardwood and softwood. Viewed as a crop, the type, in spite of early rapidity of growth, is not in the long run productive, vigorous, or easy to maintain. Furthermore, there has

been a gradual shrinkage in the use of low grade white pine, and western lumber has largely replaced the better grades of native softwood, not a large element in local production at best. Thus the price of box lumber—the main product of plantation or woodlot—is now almost 30% less than it was ten years ago, and considering the prospective supply and probable demand, it will be many years before the value will reach the previous high point.

These may be considered to be intrinsic defects inherent in the life history of the type and its relation to utilization. They have been greatly aggravated in the practice of planting by defects in method. The public has been supplied with thousands of cheap trees and told simply to plant them six feet apart. No special knowledge required. The results have been inevitable. There may be by now upwards of 75,000 acres of plantation in New England, most of it white pine. Because of poor stock carelessly handled and planted, or soil unsuitable for the species, or no account taken of competing vegetation, planting distance seldom considered, excessive weevil damage, and above all, no check on forest weeds or discrimination between weeds and desirable components of the stand—because in fact the formation and care of a forest is *not* a simple problem, an appalling percentage of existing plantations are too poor to repay their cost.

The financial outcome of forestry is plainly the final test of its practice and progress as an industry. In this connection also the plantation complex has been a misleading influence. It has fixed the idea that forestry means a long deferred return, a wait of fifty years or more to get back both the investment and the possible profit. This conception naturally involves the figuring of compound interest on original costs and carrying charges. Thus, forestry presents itself financially not in its true form as a continuous business in which current expenses are met by periodic returns, but as something between a speculation and a savings bank account, with a tendency toward the former that is only partly neutralized by the worthiness of the cause. It is true that self-supporting or continuously profitable forests cannot be created over night, but there are many where this condition could be approached in varying degrees; and to have the nature and financial constitution of such enterprises continually obscured by the bugaboo of compound interest has been a real obstacle to progress.

All these objections, serious though they are, do not mean that the planting of pure stands of conifers, even of white pine, should be wholly discouraged. On the contrary, there is much true reforestation that should and must be done by planting, some of it even with white pine. The real objection is that from the standpoint of increased production and the promotion of practice, there are so many better ways of spending money and propaganda. There exists today reliable knowledge of New England forest conditions, of proven method in silviculture, of the marketability of products, which, if rightly interpreted, means a fundamental revision in the aims of forestry.

As alternatives to the pine planting policy—perhaps they should be called complements — three principal aims stand out. Taken together they make a

concept of forestry which fits the present silvical and economic facts. In practice these involve policies which are interwoven and dependent.

First, mixed stands, either mixed hardwood or mixed softwood and hardwood.

Mixed stands, especially mixtures of hardwood or hardwood with softwood, tend to form and maintain fertile soil. In such stands, owing to rapidity of growth and natural pruning, the best quality of timber is produced, especially with softwood species. General forest sanitation is most effective, and insects and diseases are less likely to become epidemic. The original, pre-settlement forests were largely mixed hardwood with a varying element of softwood, and there is good reason to believe that only mixtures approach permanence of composition and health. Mixed stands are soundest from a business point of view: First, because they can most cheaply be established from growing stock now present on wild and cut-over land, either with the natural reproduction alone through weeding, or with natural reproduction and supplementary planting combined with weeding; and second, because the quality and variety of product make a safer investment. As regards the better species of hardwood, prices are already much higher than for low grade pine, and the indications are that for the next generation hardwood will be more valuable than softwood, being subject to less competition and more demand. In short, mixed stands are natural to the region, and they exist already—at least potentially—in a large percentage of young growth.

Second, development of the natural forest, both for its greater productiveness per dollar and as the only basis for early or sustained yields.

In Connecticut, Rhode Island, Massachusetts, and the southern halves of Vermont, New Hampshire, and Maine, there are not less than 15,000,000 acres of woodland. This amounts to between 50% and 60% of the whole area, and at least 20% more than the region contained a hundred years ago. Three-quarters of this present forest began as cut-over land with the seedlings, mainly advanced growth, of hardwoods that started under the previous stand, the sprouts from stumps, and some new reproduction, usually weed species that germinated at or near the time of cutting. The other quarter comprises the variable and more gradual replacement on old fields, most often white pine or gray birch, or mixtures of the two. Tens of thousands of these acres contain *for the first few years* the elements of a first class new forest, either of hardwood or hardwood and softwood. Hundreds of thousands are approaching an early and nearly worthless maturity through the increasing dominance of forest weeds and defective trees. In the middle and older stages of growth, through thinnings in the better stands, through more selective logging in mature or uneven-aged timber, much can be done to build up growth and forest capital and to enlarge income, both present and future; but as an alternative to planting, as a means of adding productive acres to the land, the early weeding of suitable immature wild stands will show two to four times the return per dollar.

Third, economic solutions, such as cooperative selling, forest owner associations, fairer taxation, and market improvements.

Notwithstanding the blight of western overproduction, which only time can lift, and which has not helped to make the productive handling of our timberland more attractive, there are directions in which economic factors might be changed for the better. A sound theory of production and financing is indispensable. In the long run no industry can live which cannot pay its operating expenses and fixed charges out of income. A properly organized forest will meet this test, but the small unit of forest will seldom do so; the plantation, with its deferred return, never. A promising way out, said to be already in successful operation in Finland, is through associations of owners for purposes of management and marketing. With a sufficient and convenient grouping of holdings and above all, under an able manager, there could certainly be secured more regular and frequent yields, lower costs, and more advantageous selling. The quality and hence the price of lumber could be raised, both immediately by more selective logging, and gradually by better silviculture. Such a plan would tend to put both production and financing on the only basis compatible with forestry, namely, continuity. A similar point of view is needed for final solution of the tax difficulty, much of which arises from the false conception that forests are frozen assets, to be liquidated only at long intervals, and must consequently be subsidized by some form of exemption. If forests can be thought of and expected to be units of continuous or periodic yield, as ultimately they must be in fact, taxation will be greatly simplified. In the matter of markets also it is possible by concerted studies and better organized relations between producer groups and consumer groups to find ways of economizing in distribution, of more varied disposal of low grade products, and even of developing new uses for species not now in demand.

Broadly speaking, forestry must be faced both by the public authorities and by the private owner as a genuine industry with the same technical, financial, and economic requirements as any other. In other words, if the community is to become truly "forest-minded," it needs silviculture that will get the best production for a given expenditure, forest properties that will keep on producing, and the best possible adjustments to markets and utilization. As the principal item in the program, the planting of pine does not seem to fill the bill.

# WOODLAND PASTURE[1]

By F. A. WELTON, *Associate in Agronomy* and V. H. MORRIS, *Assistant in Agronomy Ohio Agricultural Experiment Station*

AMONG stockmen the idea prevails that the quality of woodland pasture is inferior to that grown in the open. The idea is based largely on observation. Animals of various kinds having access simultaneously to pasture growing in woodland and in the open are frequently seen to graze closely that growing in the field and to eat only sparingly or perhaps not at all that growing in the woods.

Of course, there are many things which enter into palatability. Aside from the tastes and habits of the animals themselves, there are such things as the aroma and composition of the feed. The constituents that would be most likely to influence the palatability are the various sugars which, together with starch and other similar compounds, are known collectively as carbohydrates. That there should be a material difference in the kind and quantity of these compounds produced in grass grown in woodland and in the open is quite conceivable because their formation is dependent on the action of chlorophyll in the presence of light. With a marked reduction in intensity of light such as would be caused by the shade of the trees, undoubtedly there would be a corresponding reduction in the quantity of the various carbohydrates formed. Of the various constituents contained in the carbohydrate compounds, palatability would be most likely to be affected by the more simple ones, such as free reducing sugars, inverted sugars, and easily hydrolyzable carbohydrates. Accordingly, it was the purpose of this work to estimate the quantity of these various constituents in grass grown in the open and in woodland and thus to determine if there is any basis from the standpoint of composition on which to account for a difference in palatability.

In an old permanent pasture field, part of which was wooded, two areas each containing three square rods were fenced off in the spring of 1924. One location was selected beside a ravine in the open field and the other in the woods. The woodland was somewhat open as a result of logging done some 20 to 25 years ago. The open spaces have been partially closed by an undergrowth of dogwood. Very few trees are over 14 inches in diameter. In the woodland area the ground was completely covered with grass, but the stand was rather thin. It was partly shaded all the time, but not completely shaded any of the time. The intensity of light in the woods, as measured on four different dates by Ridgeway's chemical photometer, ranged from 10 to 24 percent of that in the open. The grass was clipped with a lawn mower. Only four clippings were made during the summer, the latter part of the season being so dry that there was very little growth. Enough to make samples for

[1] Contribution from the Department of Agronomy, Ohio Agricultural Experiment Station, Wooster, Ohio.

To Edmund Secrest, State Forester of Ohio, the writers wish to express their appreciation for helpful suggestions.

analyses, however, was obtained on two later dates, thus making altogether six samples during the season.

The experiment was repeated in 1925, in the same pasture field but on different and somewhat more productive areas. The one in the open had been manured a few years previously. The contour of the one in the woods was such that it tended to receive drainage from adjoining territory and this, of course, favored a more luxuriant growth of grass. The degree of shading was similar to that in the area mowed in 1924. Four clippings for yield were made, the last being on August 19. Little growth was made during the balance of the season on account of dry weather. Samples for analysis, however, were obtained on one later date, thus making five altogether.

In both seasons the samples for analysis were cut into pieces, ½ to 1 inch in length, placed in wide-mouthed, glass-stoppered bottles, and heated in alcohol at 78° C. for approximately an hour. The strength of the alcohol, including the moisture contained in the grass, was approximately 70%. After standing about three months the samples were analyzed for free reducing sugars, inverted sugars, and easily hydrolyzable carbohydrates.

The yield of the green and dry material calculated to an acre basis, also the relative water content of the grass grown in the open and in the woods, were found to be as shown in Table I.

It may be noted that the yield of the grass grown in the woods, on the dry weight basis, was in both years about one-third that grown in the open. The water content of the grass grown in the woods averaged about 4% higher than that of the grass grown in the open. Early in the season the difference in moisture content was least marked.

TABLE I

| | 1924 | | 1925 | |
|---|---|---|---|---|
| | Open | Woods | Open | Woods |
| Green weight, lbs. | 3,872 | 446 | 11,076 | 4,236 |
| Dry weight, lbs. | 1,126 | 347 | 3,264 | 1,138 |
| Per cent of moisture | 70.95 | 75.10 | 69.31 | 73.37 |

TABLE II

| | 1924 | | 1925 | |
|---|---|---|---|---|
| | Open | Woods | Open | Woods |
| Reducing sugars | 0.93 | 0.63 | 0.83 | 0.75 |
| Inverted sugars | 2.70 | 1.38 | 2.22 | 1.47 |
| Easily hydrolyzable carbohydrates | 6.74 | 4.41 | 5.26 | 4.71 |
| Total carbohydrates | 10.37 | 6.42 | 8.31 | 6.93 |

The per cent of carbohydrates in fresh material of the two kinds of grass was as shown in Table II.

In both years and on all dates of clipping (with one exception), the quantity of free reducing sugars, inverted sugars, and easily hydrolyzable carbohydrates was higher in the grass grown in the open than in that grown in the woodland. The single exception was in the free reducing sugars on the first date of clipping in 1925. The total carbohydrates in the open were 161 percent of the total carbohydrates in an equal amount of grass produced in the woodland in 1924, and 120 percent of that produced in the woodland in 1925.

In both years there was more than two and one-half times as much green weight produced in the open as in the woodland. The total carbohydrates found in the open, therefore, as compared to the carbohydrates in the woodland, were at least two and one-half times 161 percent or over 400 percent in 1924, and about two and one-half times 120 percent or approximately 300 percent in 1925. If an allowance was made for weeds, the difference in carbohydrates would be even greater, for in the woodland the weeds are usually more abundant. In 1924, there were 32 percent more weeds in the woodland than in the open.

That these differences in carbohydrates are due to the shading effect of the trees is confirmed by the results obtained in a supplementary test in which grass was shaded artificially in 1924 and 1925. In these tests the shade was furnished in one case by frames made out of lath and in another by frames covered with cheesecloth. In both cases the reduction in intensity of light was about 50 percent. At east time of cutting, samples of grass were taken and preserved in alcohol in the same manner as were those taken from the woodland and open pasture.

Analyses of these samples showed that in equal quantities of shaded and unshaded grass the total amount of carbohydrates produced in the open in 1924 was 169 percent of that grown under lath and 175 percent of that grown under cheesecloth in 1924. In 1925 it was 154 percent of that grown under lath and 143 percent of that grown under cheesecloth.

The yields of the artificially shaded and unshaded grass, however, were more nearly equal than were those produced in the open and woodland. This is perhaps to be expected, for the moisture conserved by the artificial shade would be utilized in the production of grass and not diverted to the use of the trees as in the woodland pasture. Determinations made on the soil at irregular intervals during the progress of the experiment showed that the artificially shaded plots ran from 3 to 8 percent higher in moisture content than did the unshaded. The average moisture content of the grass shaded by lath and cheesecloth was about 5 percent higher than was that of the unshaded grass.

In protein content the grass grown in the open was somewhat richer than that grown in the shade on the green weight basis, but on the basis of dry weight the reverse was true.

From the data presented in this paper it is clear that woodland pasture differs from that grown in the open in both quantity and quality. The nature of the difference in quality, that is, the reduction in sugars and other simple carbohydrates compounds in the woodland pasture, would certainly make it less nutritious and quite probably less palatable, for animals of most kinds have a relish for sweet things. Foresters have long advocated the advisability of excluding livestock from timber land, particularly of hardwoods, on account of injury sustained through defoliation, cropping of bark and stems, uprooting and killing seedlings, trampling roots, packing the ground, etc. Farmers contend that these injuries are more than offset by the pasture obtained. In view of the relatively small quantity and inferior quality of the woodland pasture it would seem that this claim of the farmers is not well founded.

# INFERIOR SPECIES IN THE NORTHERN ROCKIES

By R. C. HALL

*Senior Forester, Forest Taxation Inquiry, U. S. Forest Service*

LOGGING Engineer Phillip Neff, in his recent article[1] entitled "The Inferior-Species Problem in the Northern Rocky Mountains," makes an interesting comparison as to value and cost of production of white fir and hemlock in contrast to white pine, for stands in which these species are associated. He concludes (pages 595-6) that during the three years, 1925 to 1927, an average of 60,000,000 board feet of white fir and hemlock were cut in northern Idaho and eastern Washington at a loss to the producers of at least $5 per M, or a total loss of $300,000 per year. He also concludes that heavy losses on these species have for many years been the rule and profits the rare exception. Yet he states that the lumber companies continue to cut these species from their own timber lands.

In support of these conclusions as to losses suffered in the exploitation of white fir and hemlock, graphs are presented (page 592) showing the cost of producing lumber of these species from trees of different diameter and the corresponding average values of lumber, both costs and values reduced to a log scale basis. In regard to the method of determining cost it is stated: "These costs include logging, freight on logs, milling, shipping, selling and seven per cent for interest and three per cent for risk or, in other words, all costs plus ten per cent for interest and risk" (page 594). Apparently the ten per cent allowance for interest and risk is based on production costs, rather than on average invested capital.

It would be interesting if Neff had analyzed the production costs upon which his graphs are based, since some very substantial expenses necessary to a large scale lumber operation equipped with sawmill and logging railroad are independent of the quantity of timber removed, and should be omitted for his purpose. The cost of the sawmill plant, less estimated salvage value, is a legitimate charge on the operation as a whole, and varies little in total amount whether the low grade species of the tributary timber supply are manufactured or allowed to remain in the woods. The cost of constructing the logging railroad and of its necessary equipment, less salvage, is practically unchanged, whether all of the timber in the territory which it serves is removed, or only a part of such timber. The same is true of certain improvements in the woods. It is partly true of the office overhead and superintendence, since it is seldom practicable to compensate entirely for a materially lowered cut per acre by extending operations over a sufficiently greater area to maintain the same volume of production per year. Such fixed charges for the entire operation, the total of which does not vary with the quantity of timber produced, will hereafter be referred to as the fixed overhead. The cost of stumpage when paid for in a fixed sum regardless of the quantity cut is similar

[1] Journal of Forestry, May, 1928, page 591.

to fixed overhead in that it is a charge on the gross returns of the entire operation and does not affect the desirability of cutting or leaving any particular kind or size of trees.

Whether it is profitable to remove a class of trees in mixture with a stand which is being operated by the owner is not governed by the difference between the selling price of the lumber from those trees and the total cost of producing it, if one includes in such total cost the fixed overhead. It is determined by the difference between the selling value of the lumber and the operating cost alone, provided that operating cost is defined as including only those expenses which vary directly with the quantity of lumber produced; that is, as equivalent to total cost as usually understood, less all fixed overhead, stumpage, and allowance for interest and profit. The difference between selling value and operating cost so determined should be substantial enough to afford a reasonable return on the additional working capital necessary to provide for the extra expense of handling the trees in question. It should also make some contribution to fixed overhead. Applied to the case under consideration, if the sale of white fir and hemlock lumber will pay its bare operating cost plus interest on the investment in this cost alone, with an appreciable margin to apply on fixed overhead, then it is profitable to operate these species. Under such conditions, the total profit of the entire operation will be increased or the total loss reduced, as the case may be, by bringing out these inferior species, regardless of the fact that the ordinary method of bookkeeping by which all costs are averaged may show a loss on these species, and either a profit or a smaller loss on the white pine.

This principle is based on sound common sense reasoning, and has been set forth from time to time in the literature of forestry. It was brought out in 1912 in an article[2] of which the writer was co-author. Ashe and others have treated this principle as fundamental in connection with their studies of the operating value of small trees. In a paper[3] before a meeting of the North Carolina Pine Association Ashe explains the principle for determining profit or loss in handling small trees, which is equally applicable to inferior species, as follows: "In order to determine whether there is a profit in handling a small tree there must be assurance that the actual piece-labor costs in converting it; that is, the labor cost in felling, in skidding (excluding road construction), in loading, in hauling (excluding railroad equipment, construction and maintenance, but not operation) and handling and sawing at mill (but not overhead of mill construction), together with insurance, deterioration, and selling commission; that the sum of these items, plus a profit, when they are taken from the selling price of the lumber (the actual grades and sizes which such a tree will make) will leave a surplus. In case there is a surplus, even a nominal one of not less than one dollar, this surplus will go toward reducing the cost of road construction, of railroad construction

[2] The Distribution of Costs and Values in a Lumber Operation, by R. Clifford Hall and Dean W. Martin, Forestry Quarterly, December, 1912, page 679.

[3] Cutting Timber to Increase the Margin of Profit, by W. W. Ashe, pamphlet dated November 18, 1925.

(items which I have called transportation overhead), mill construction (mill overhead), and general office overhead, which should include general taxes and general carrying charges of the timber as well as general office expenses other than selling. The small tree must repay every item of expense except road construction, railroad construction, camp construction, mill construction, and general office overhead, and it must make a contribution to general overhead."

The reader of Neff's article is at a loss to know with certainty just how the fixed overhead has been taken into consideration in the figures upon which his graphs of "Tree Values and Cost of Production" are based. It would seem that the item of sawmill depreciation is included in his item of "milling" and that depreciation of railroad construction and equipment is contained in his item of "freight on logs." If these fixed overhead items were omitted, it would be natural to expect some explanation in view of the definite statement in regard to fixed charges in the woods. On this point, it is said:[4] "I have charged all improvements in the woods to white pine and assumed that the white fir and hemlock logged were of an average size larger than white pine and more accessible to mainline transportation." Yet there appears to be no reason for charging to white pine alone the cost of all improvements in the woods that does not apply with equal force to all other fixed overhead.

This comment, written by one who has no knowledge of lumber operations in the Northern Rockies, is not intended to support any conclusions as to the profit or loss in removing inferior species contrary to those of Neff. In fact, the margin of loss in the inferior species indicated by his graphs is so great as to suggest the possibility that it would not be overcome by revision of the cost figures along the lines indicated by the writer. The point is that the data presented by Neff do not fully substantiate his conclusion. It is an extraordinary situation if all of the lumbermen of the Northern Rocky Mountains fool themselves all of the time in cutting white fir and hemlock on their own lands, and in so doing obstinately persist in suffering substantial and unnecessary losses. If the fact that this situation exists can be demonstrated beyond question by an adequate analysis of the known logging costs in connection with figures of lumber value such as Neff has used, to do so would seem well worth while. It would give greater force to the proposal that these species should be left for the second cut when they are likely to be more highly valued.

[4] Page 594.

# REVIEWS

**Silvicultural Systems.** By R. S. Troup, *Director, Imperial Forestry Institute. Oxford University Press, 1928. Pp. 199, 86 illustrations from photographs.*

If there were put to me the question: "What is the best book on silviculture written in recent years?", I would point, unhesitatingly, to Troup's "Silvicultural Systems." Professor Troup, well known for his "Silviculture of Indian Trees," was and is the one man who would dare to write a standard work on "Silvicultural Systems." Troup alone knows the three great languages, a knowledge of which is essential for the writer of such a book; Troup alone has worked for years in primeval woods, in India, and has had, on top of that, a dozen years of travelling and of excursioning, as leader of British expeditions, in the woods of Germany, France, Czechoslovakia, and elsewhere.

No one in America can teach—or shall I say "should attempt to teach"—silviculture who does not "own" this capital standard book on Silvicultural Systems. True, Troup is modest enough, in his preface, to say: "The reader is asked to regard this book not as a means of acquiring a complete knowledge of silvicultural systems, but rather as a guide towards the practical study in the forest." Nevertheless, so long as we are unable to study any systems in the American forests, we shall be compelled to study them with Troup's book—in hand.

After the introduction, comes the chapter "the clear-cutting system." Unlike most modernists in Europe, Troup does not overlook its merits. Size, form, and arrangement of coupes are discussed, and the possibilities of natural regeneration in connection with clear cutting are given. Everything said is concise, clear, and based on an amazing knowledge of forest history, of all countries.

Next come the various systems of "successive regeneration fellings." There are described and illustrated by diagrams and pictures the uniform system, the group system, the irregular system, the strip system, the wedge system, and the selection system. The presentation is capital. It is the evidence given by an eye-witness who knows the facts to perfection.

The chapters on "two-storied high forest" and on "high forest with standards," where the author describes also the old French system of "tire et aire," are brief. But Troup has the knack of giving, with the help of illustrations and in a few words, the history, the application and the applicability, the various steps required, and the outcome of these and of any other systems.

Then come three chapters on the coppice system, on the coppice selection system, and on coppice with standards, followed by a chapter illustrating the conversion of coppice systems into systems of high forest.

The closing chapters are devoted to "combinations of the systems," to "choice of system," and to "changes of system" —for no one system has come to stay. The last chapter deals with modernist ideas in silviculture (Dauerwald), and it proves that Troup is the best-read man in silviculture of us all.

The illustrations are capital; and the Oxford Press has made, in printer's work and in illustrations, the finest book that stands in a forester's library, so far.

Is there nothing wrong with the book? Certainly, there are some small slips, some unnecessary repetitions (surprising in so concise a book); and, well, the silvicultural systems followed by our National Forest Service, today and in the past, are omitted. Maybe the Forest Service, itself, will give us that book, in the near future; and I promise to place it next to Troup's book even if it fails to parallel, in its make-up, the high standard set by the Oxford Press.

Lest I forget: Troup's book is "the first of a series of manuals dealing with different branches of forestry" which old Oxford and its new Imperial Forestry Institute are promising to supply.

C. A. Schenck.

**Loblolly Pine in Maryland.** A Handbook for Growers and Users. By Joshua A. Cope. *Bulletin State Department of Forestry, Univ. of Maryland, Baltimore, Md., 1923.*

The writer promised to review this excellent and meaty bulletin at the time of its first appearance in 1923; since then a second edition has been published. Apologies are due both the author and the profession for the delay in fulfilling this promise.

Says the introduction: "Already an encouraging start in forestry practice" with loblolly pine "has been made by large timber holding and timber using companies" on the Eastern Shore of Maryland, "under the direction of the Forestry Department. In addition, several private owners, by cutting mature timber under definite regulations, by making thinnings in growing stands, and by planting out young forests, have given further impetus to the practice of forestry." Excellent markets and remarkably fast growth of the pine have been at the bottom of this phenomenon.

Surely herein lies sufficient justification for publishing "a handbook for growers and users" in Maryland, in spite of the fact that Ashe has already discussed loblolly pine in North Carolina in such detail that his bulletin is unquestionably the most complete account of a single species in American forestry literature. But Ashe's bulletin, in the words of one of its greatest admirers, is "close reading," and the publication now under review is far better adapted to popular use. It is written in simple style and splendidly illustrated, in spite of the absence of special plates. The only criticism of the style is that the effort to keep the bulletin "popular" has occasionally resulted in statements of questionable accuracy. For example, it may be doubted whether the failure of loblolly pine to produce seed annually is adequately accounted for by the following: "It is not possible for the individual trees to store up enough food for seed production oftener than every third or fourth year."

Part I of the bulletin gives the customary botanical description of this valuable and interesting species, which in Maryland finds its most northerly extension. Loblolly pine is increasing in local frequency, on a wide variety of sites. Cope's description of forest types is rather confusing, because the associates listed on various situations (sandy uplands, poorly drained soils, and inundated areas) do not coincide with those named in the later more detailed description of six "types." Cope describes loblolly pine as intolerant; moisture-loving; excurrent (why not? It's a conifer!); having a plastic root system and therefore windfirm on most sites; seeding prolifically and frequently, its seeds being light and widely distributed by the winds; unexacting of seedbed; growing at an extraordinary rate; and having few enemies except fires.

The reviewer is inclined to feel that a rather poor case has been made for the intolerance of the species, but finds the discussion of the fire evil forthright and convincing. The latter is particularly welcome in view of the fact that some very competent men in the profession have "wobbled" when it comes to denunciation of fires in the southern pineries. There is certainly no escape (New Hampshire papers please copy!) from the figures on rate of growth, and the yield tables appear to meet the tests recently suggested by the committee on standardization of methods for the preparation of volume and yield tables (see the JOURNAL, Vol. XXIV, No. 6). An average annual growth per acre of 158, 129, and 102 cubic feet, on Sites I, II, and III, respectively, is attained by full stands at 25-35 years. The tremendous capacity of the species to produce sawlogs is shown by an average yearly growth of 782, 556, and 383 board feet on the same quality sites at 50-60 years.

Part II is a detailed description of the various forms in which loblolly is utilized, and contains substantial and impressive economic data. For each class of material—lumber, staves and headings, mine props, piling, pulpwood, fuel wood, laths, and special products—there is a complete account of the specifications, methods of manufacture, costs of manufacture, and stumpage values. Many very valuable converting factors are given. Low costs of manufacture, combined with good prices for the final product, allow the realization of excellent stumpage values, in spite of a liberal allowance (25 per cent) for profit to the manufacturer on all of his costs. The stumpage rates for lumber work out as follows: Box shooks, $11.31-15.56, and mine planks $9.31-12.56 per thousand board feet. Both of these prices, theoretically arrived at, Cope admits are about 10 per cent above the prices actually received for this class of stumpage. Converted into board feet, stave material has a stumpage price of $9-9.80, and mine props (if the converting factors hold in all cases) of $4-16.75 per thousand. One is disappointed at not finding stumpage values for piling converted to a board foot basis; in the far South piling undoubtedly yields a better stumpage rate than sawlogs. Pulpwood is calculated to have a stumpage value of $2.13 per land cord.

Part III, which deals with management, is in the reviewer's judgment weaker than the rest of the bulletin; inevitably so, for it is the old story of lack of conclusive information based on careful research. The writer admits that

some of his criticism of the silviculture recommended may be engendered by lack of familiarity with the species at the very northern extension of its range, and submits that no one is in a position to speak with final authority on the silviculture of the southern pines.

In spite of the fact that "annual cutting marches far in advance of annual growth," the author is true to the Maryland principle of individualism, and dismisses in cavalier fashion any thought of public regulation of private cutting.

In view of the original mixed character of the Maryland forests there is real danger in Cope's advice to grow loblolly pine *exclusively*. Radical alterations in the original composition of a forest are just as likely to have disastrous results as any other wholesale interference by man with natural forces which have operated over vast periods. Insects and diseases, formerly endemic, become epidemic. The very nature of the soil may change under such manipulation, as Fisher has definitely established at Petersham.

Clear cutting, with the reservation of four seed trees per acre, seems all right as far as it goes, but unfortunately is the sole prescription for natural regeneration. It will, of course, result in even-aged stands exclusively. Such definite abandonment of all-aged stands in favor of even-aged ones appeals to the reviewer as little as does the conversion of mixed stands to pure stands. One further regrets to read this dictum concerning seed trees: "If they are crooked or forked—so much the better."

Any one who has wrestled with the problems of fire prevention in the "piney woods," and knows how easy it is for the general public to misunderstand the deliberate use of fire in silviculture, cannot grow enthusiastic over the recommendation that the mineral soil be exposed for reproduction by burning. Certainly the writer has seen few, if any, situations in the far South where there was a plain need to remove the duff from cut-over lands in order to obtain satisfactory natural reseeding. There is no danger that in a region of heavy precipitation and long growing seasons, oxidation and decay will not promptly reduce the duff in cut-over lands to harmless and often highly beneficial depth; analogies recently drawn by Chapman from Swedish and Indian silviculture to support the use of fire in the South would be more impressive were he able to point out real parallelism in conditions. Fire may, of course, be necessary in Maryland, but until the necessity is firmly established by careful experimentation, its use seems a dangerous recommendation. Furthermore, the cost of so-called controlled burning is almost certain to be high. Cope gives a single instance, where he admits that the burning cost \$4.67 an acre, and is put to it to account for the size of the item.

The recommendation that all hardwoods be removed, either with the axe in the course of the cutting, or by discriminating goats, will result in the pure pine stands which have already been characterized as risky propositions. On sites where hardwoods were mixed with pine in the original forest, most New England foresters are agreed that it is a mistake even to attempt to eradicate the hardwoods. The species of pine in New England is of course different, but the general principle should hold.

It is most unfortunate that anyone in this day and generation should recommend direct sowing for artificial refores-

tation, and it is positively distressing to read that the seed should be broadcast ("broadcasted" in Cope's diction). Does not broadcasting deliberately throw away the one great advantage of artificial reforestation, namely, uniform spacing? Again, it is hard to grow enthusiastic over the use of wild stock for planting, when nursery-grown stock has elsewhere invariably proved superior, and is very easily grown by an intelligent farmer.

Cope gives some unique and very valuable figures on the effect of removing fallen pine needles from a 55-year-old loblolly stand over a period of several years. Two sample plots, one from which the leaf litter had been removed for use on a truck farm, the other left untouched, showed almost precise agreement in the number of trees per acre and their average diameters, but the average dominant on the untouched plot was 78 feet tall, as against 68 feet on the raked plot. Furthermore, the untouched plot contained 5287 cubic feet, as against 4476 on the raked plot, and would cut 24,800 board feet as against 18,600. At prevailing stumpage prices Cope figures that the leaf litter has added over $1 an acre to the value of the stand! He goes on to say, however, that the "fertilizing" value of the litter to the truck crops was very much greater than it was to the tree crop. As a commentary on this, it may be mentioned that in the strawberry district of Louisiana a year's accumulation of pine needles is said to sell for as much as $5 an acre, but it has been the reviewer's understanding that the fertilizing value of this material was altogether secondary to its value as a mulch.

The type of thinning Cope recommends for loblolly pine appears to be a "thinning from above," and his figures indicate 50 per cent higher board foot yields from a stand thinned 20 years ago, on a poor site, than from an unthinned stand. This checks in a negative way at least with the present conception of the Southern Forest Experiment Station, gained from a few plots in Louisiana; the Station has come to doubt whether the "thinning from below" on a good site is an unqualified success with loblolly pine.

Cope's discussion of financial rotations and profits to be derived from growing loblolly pine is refreshing in its matter-of-fact tone. It does not enter his head, in writing for an audience schooled by practicalities, to apologize because timber growing does not promise to be a bonanza. In spite of taxes running from 20 to 70 cents an acre he makes an excellent case for the enterprise when land costs $15 an acre, and regeneration $5, and when the stumpage value to be expected is only $10.50 per thousand; at 4 per cent compound interest he figures on a profit of $110 per acre in stands on average sites cut at 50 years. If 6 per cent compound interest must be paid he states without comment that no profit can be shown at any age. Better than average sites, natural regeneration, and stumpage worth more than $10.50, may well earn a profit over 6 per cent.

A rather sketchy account of how to estimate the contents of a stand, which the author avers will give within 15 per cent of its actual contents, lacks somewhat in conviction. His recommendation that the volume of a sample plot be obtained by picking out ocularly a tree of average size and height, and multiplying its volume by the number of trees on the plot, is almost as risky as his earlier recommendation of the use of a single dominant tree in determining site quality!

The inclusion of a sample form of timber contract is typical of Cope's practical treatment of his subject throughout.

To sum up, this is a first-class bulletin, and contains far more substantial information than it is generally possible for men to assemble who, as the reviewer well knows from personal experience, are generally overwhelmed by a miscellany of jobs. The assignment of men to research work exclusively by an increasing number of state forestry departments is a hopeful augury for the future of state publications.

R. D. Forbes.

*Comments by the Author.* Forbes, in reviewing my bulletin on loblolly pine, takes exception to the method proposed for securing reproduction by leaving seed trees and broadcast burning. In support of his idea that it is poor policy to secure reproduction in this manner, he quotes certain figures from the text of the bulletin which would lead the reader to believe that the cost of site preparation, that is, broadcast burning, amounted to $4.67 per acre.

The figure of $4.67 per acre for burning brush referred to a conversion experiment—hardwoods to pine—where the hardwoods were in complete possession and averaged 15 feet high and 3 to 4 inches in diameter. On page 56 of the bulletin, $1.50 per acre is plainly stated as the cost of site preparation (broadcast burning) following logging. This cost of $1.50 per acre included making a fire line entirely around the tract (see picture on page 54) and raking brush away from seed trees.

The reader is also led to infer that broadcast seeding is recommended in Maryland in establishing a stand of loblolly pine artificially. It was the writer's intent, and is so stated on page 62, to encourage the use of planting stock. Other methods such as broadcast and drill seeding were merely mentioned as possibilities.

J. A. Cope.

**Twenty Years' Growth of a Sprout Hardwood Forest in New York.** A Study of the Effects of Intermediate and Reproduction Cuttings. By J. Nelson Spaeth. *Bulletin 465, Cornell University Agricultural Experiment Station, Ithaca, N. Y., 1928, 49 pp.*

In 1905 J. G. Peters of the U. S. Forest Service made a working plan for Crumwold Forest, a property of about 300 acres located near Poughkeepsie, New York, and owned by Colonel Archibald Rogers. Specific treatment was advised for the different stands. Thanks to the intelligent interest of Colonel Rogers, the cuttings provided for in the plan have been executed.

Peters in 1905 also established 43 sample plots comprising approximately 5 per cent of the total area and representing the range in existing conditions. These plots were marked for an intermediate or reproduction cutting. The cuttings were made and the trees removed and those left were tallied. The purpose of these plots was to serve as models for the owner to follow in extending the cuttings over the entire property. In 1925, 40 of these sample plots were remeasured and studied by Professor J. Nelson Spaeth of Cornell University.

Particularly to foresters working with oak stands, Spaeth's bulletin will prove of interest. Very little information is available as to growth in the oak types. Data resulting from actual forestry operations are almost non-existent, hence these well authenticated figures are most acceptable.

The bulletin opens with a description of the forest, which is classified into white oak, chestnut oak, and harwood swamp types. After describing the method of study, growth data are then presented, divided into diameter growth of individual trees, volume growth of the sample plots, and volume growth by compartments. Finally the silvical effects of the intermediate and reproduction cuttings are discussed.

One of the most interesting features is the comparison of diameter growth in "managed" and "natural" stands. The growth of individual trees in "managed" stands is that made by the trees of different diameter classes since the 1905 cutting. Growth in "natural" stands is obtained from stem analyses made by Peters. More information as to the character of the trees analyzed by Peters, particularly as to the crown classes of the analyzed trees, would be desirable in judging the value of the comparison. Spaeth's conclusion (pp. 13-14) is that white oak and chestnut oak trees of merchantable diameters (12 inches or more) can be obtained from 30 to 50 years sooner in managed stands than in natural stands. He finds some increase in growth of red oak in managed stands as contrasted to natural stands, but not so much as with white and chestnut oak. The reviewer, from observations elsewhere, believes that proportionally as great increases can be secured with red oak as with the other oaks.

These results are in line with the fact that oaks require freedom for crown expansion if rapid growth is to be maintained. In fact, the growth rates given by Spaeth in Table 3, p. 10, are too conservative and not a fair indication of what may be secured under good management of oak stands. This is true because the plots on the Crumwold forest, previously unmanaged, have received only the one cutting in 1905 and no treatment since then. Good silviculture in this forest would have required that from five to fifteen years after the first cutting a second cutting be made. From personal observations on the property the reviewer knows that second cuttings should have been made years ago in a number of instances to relieve crowding in stands which have closed since the first cutting. Hence the diameter growth figures given by Spaeth are very conservative and are indicative of the principle that increased diameter growth may be expected rather than as to the amount of such growth.

Mean annual volume growth in the white oak type is estimated at 190 to 200 board feet per acre per year, which under continuous silvicultural management will be increased.

Trees of seedling and sprout origin in managed stands, while growing in diameter at quite different rates in early life, were found to grow at approximately the same rates after reaching 10 inches in diameter. For red oak this occurred at the fiftieth, for white oak at the sixtieth, and for chestnut oak at the sixty-fifth year. Consequently when products from trees over 10 inches in

size are wanted, origin is of little importance from the growth standpoint.

The reviewer cannot agree with Spaeth's listing of white ash, hickory, and hard maple as important saw timber species in the upland oak types of the lower Hudson River Valley. These species cannot successfully compete with the oaks on the relatively dry soils characteristic of these types. At maturity the ash, hickory, and hard maple occupy subordinate places in the canopy, or in managed stands have to a large extent been removed in thinnings before the end of the rotation. On bottomlands and the better class of hardwood swamps, white ash is unquestionably a promising tree. On the uplands while the white ash and hard maple often establish abundant reproduction they cannot in the long run keep pace in growth with the oaks.

The results since the 1905 cuttings indicate that seedling reproduction of all the important saw timber species can be secured.

R. C. Hawley.

**Wurzelstudien an Waldbäumen.** Die Wurzelausbreitung und ihre waldbauliche Bedeutung. By H. H. Hilf. *121 pp., 14 pl., 41 fig. M. and H. Schaper, Hannover. 1927. 5.40 Mk.*

This interesting little book reports the results of some 13 years' study of the roots of spruce, pine, and beech. A study of the roots of trees 50 to 80 years old entails an enormous amount of physical effort, which may account for the fact that investigations such as this are not more often made.

The results obtained confirm the general impression held by most foresters regarding the characteristics of the root systems of spruce, pine, and beech, but since these results are based on actual data obtained by digging up and studying the root systems of some 43 trees from 50 to 80 years old, the reviewer feels that they are worthy of more than passing comment.

The roots of spruce were found to extend almost equally in a radial direction and to branch extensively only beyond the limits of the crown. Most of these roots extend horizontally. Under certain conditions, however, lateral branches which extend downward are produced at almost right angles to these horizontal branches. These lateral branches are not produced when spruce grows in moist soils, which explains its susceptibility to windthrow and drouth when growing under such conditions.

The roots of beech have numerous bends and branch prolifically, even near their point of origin, so that the entire soil area under the crown is filled with roots. These roots do not extend beyond the crown, but more or less diagonally to various depths in the sub-soil. Branches from these deep roots extend upwards to the humus layer, where they branch prolifically, so that in spite of the deep main root system of beech, the tree is particularly dependent upon the humus layer for its nourishment.

In pine, the root systems differ greatly, depending upon the site. In good, fine, sandy forest soils, a well-developed tap and numerous lateral branches are produced. On lime soils, the growth of both the tap roots and the lateral roots is stunted. On the best soils the lateral roots are richly branched and are quite

long, while on the grassy and on vaccinium sites the length of the lateral roots is greatly reduced. On the poorer sites, however, the lateral roots are very long, but little branched.

The crown radius of beech is a little greater than the average root system. The average root length of spruce on dry ground is 1.6 times the crown radius, while on moist ground it is 1.9 times the crown radius. On vaccinium sites, the average root length of pine is 1.5 times the crown radius, while on the best sites the average root length is about 2.1 times the crown radius. On poor sites, the average root length may be 2 or 3 times the crown radius.

In fully stocked stands, the average root length and crown radius of beech were found to be the same. In spruce, the average root length is from 1.5 to 2 times the crown radius. In pine on sites III-IV it is 1.5 times; on sites I-II, 2 times; and on site V, 2.5 to 3 times the crown radius. Although the author does not so state, it may be that sites III-IV include the lime soil and the vaccinium types. If so, this would account for the inhibition of root growth on these sites.

The effect of the roots of these trees on the physical characteristics of the soil is also discussed. It is claimed, on account of the saucer-like root system of spruce, every movement of the tree due to wind causes a tamping of the soil; while movements of beech, due to the fact that the roots run diagonally in the soil, tend to loosen it. In pine, these effects differ, depending upon the particular type of root development as influenced by the site.

A bibliography of 95 references, all in German, is appended.

HENRY SCHMITZ.

**Montana Forest and Timber Handbook.** By R. N. Cunningham, S. V. Fullaway, Jr., and C. N. Whitney. *School of Forestry, University of Montana, in cooperation with U. S. Forest Service. Missoula, Montana. Pp. 162; plates and unnumbered half tones 22; figures, maps and graphs, 12; tables 45. February, 1926.*

When the reviewer, in the May issue of the JOURNAL, in commenting upon the Idaho Forest and Timber Handbook intimated that it was the first of its kind, he was reminded that the Idaho handbook was preceded by the Montana handbook by more than a year. The two are similar in form and treatment, three of the authors are common to both, and they are both principally the work of the U. S. Forest Service.

The forests of Montana contain about 50 billion board feet of timber, of which 75% is in the western part of the state. Nearly 70% of the total is controlled by the Federal Government. The annual cut is about one-half billion board feet. Lumbering ranks first among the state's manufacturing industries in value of finished products and second in number of wage-earners employed. The handbook describes the forest resources of Montana in detail with a number of tables and charts, such as classification of ownership; classification by counties; and ownership by counties. The production of forest products is also covered in detail with a large amount of statistical data such as annual cut by species and products; source

of annual cut; history of lumber production; production by species, mill class, and counties; products manufactured from the several species; and regional distribution of lumber products by grades and species (this latter set of tables is particularly interesting and valuable and speaks well for the government and association statistical agencies). Consumption of forest products is treated in a similar manner. Of particular interest is the heavy consumption of railroad cross ties and mine timbers; these two account for over a third of the forest products consumption in the state, and reflect its great railroad mileage and its extensive mining activities.

An important part of the handbook is presented under the title "The State's Forest Problem." It points out those economic factors that affect most vitally the continuance of forest products as an important resource of the state. Fire, insect, and disease losses, growth, taxes, and public policies are important subheads.

Monographs of Montana's commercial tree species require seventy pages of the text. The species covered are western yellow pine, western white pine, lodgepole pine, western larch, Douglas fir, Engelmann spruce, white fir, western red cedar, and hemlock. The treatment is under the following heads—history and nomenclature; botanical and silvical characteristics; characteristics of the wood; mechanical and physical properties; and principal uses.

The final twenty-two pages are devoted to directories of sawmills, timber products producers, wood-using industries, wood-preservation plants, retail lumber dealers, forest agencies, and a composite geographic directory.

EMANUEL FRITZ.

**My Trip to France.** A STUDY OF THE FRENCH MARITIME PINE REGION. By Austin Cary. *A series of six papers, with introduction (28 pages qto.) published in the Naval Stores Review (Savannah, Ga.) and reprinted.*

As a rule the American forester who visits Europe brings back a lament concerning the inadequacy of our conditions, the impossibility of applying here European silviculture and utilization. It is refreshing when one of us who we know is doing something and getting results views European conditions intimately, comes back and tells us that if all is not well with the world at least we are making gratifying progress. This is Dr. Cary's hopeful message as conveyed in this series of papers after comparing the turpentine industry of the Landes of France with that of the southeastern United States. His observations with comparisons and conclusions fortified by figures relate to a single European species, the maritime pine of the Bordeaux district of southwestern France, and to its utilization for a specific purpose, as well as a comparison of that species with the American slash and longleaf pines.

The points that stand out are that our native pines are superior in yield to the maritime pine. A slash pine at 35 years is the equivalent in yield of a 60-year-old tree of maritime pine on the best of the French sites. [It is perhaps most fortunate that the attempt to introduce the maritime pine into Florida was futile. If partially successful we might now have, at least within the National Forests, plantations of it, which would be like those of the Scotch pine in compari-

son with the shortleaf, inferior in every respect to the possibilities of the native species. Note by reviewer.]

In the field of technique "we are perhaps doing what is called for as it is." On the whole our technique, although radically different, is equal to that of the French when it is considered that our wages are higher and that far higher monetary returns must be secured per worker. The French, for example, extend the scarified face 10 feet up a tree in 4 years' time; here under good conditions we work scarcely more than 5 feet. This is some offset to the narrower French face and it seems possible that the split face developed since Dr. Cary's trip may prove much superior to the French face in giving a far higher yield per cup, and at the same time permit equally as rapid covering of the exposed faces. Where we are weak is with silviculture, and weak there perhaps because we have had too few men who, like Dr. Cary, could develop a local system. He emphasizes the desirability for proper spacing over here; for thinnings when they can be made—possibly making them, as Alexander Sessoms is now doing, without being able to sell the material which is cut, the expense being covered by the hope of betterment of the stand, a hope in which is seen the possibility of 100 faces per acre as a minimum, as compared with an average of 25 per acre in the Landes.

American labor, he thinks, is as intelligent as that of France. In France technical men encounter serious difficulties when putting into effect improved methods, due to the opposition of workers' organizations. He advocates the establishment of fire lines (already being constructed by a few far-sighted individuals in the Southeast) while land is yet cheap and before it is occupied by heavy stands of timber (thus avoiding one of the French mistakes), and the employment of machinery for making thinnings in young stands of slash pine. His observation that it has been more difficult to organize property owners over there against fires than our own, if correct, must give some cheer to those who are disheartened over the indifference of our native stock to fires—yet few have had to fight the fire evil under more adverse conditions than Dr. Cary. What is wonderful is that notwithstanding the adverse conditions which exist in the Landes, more than one-half of the forest area is in private hands. While the efficiency of forest management suffers from the lack of government control, his observation "that at least the people reserve their independence" savors of sturdy New England conservatism.

Cary's picture, although it is rather genre and contains many seemingly irrelevant details, yet on the whole is a graphic presentation of the French turpentine belt; a comparison of the country, of the people, and of their industry with our own with which it competes.

W. W. Ashe.

**Forstliche Arbeits-Wissenschaft.** By H. H. Hilf, L. W. Ries, and E. G. Strehlke. *Publ. by Der Deutsche Forstwirt, Berlin, 1927. Pp. 75.*

Since the war great interest has been shown by German foresters in the application of efficiency and cost accounting to forest labor. Indeed, a science of "Forestry Labor" has grown up. Taylor and Ford (even "Henry" himself!)

are the prophets of the new era. The stop-watch and the graph have become the tools of these "efficiency hounds," American industrial organization the cynosure of their eyes.

These three essays, delivered at the meeting of the Deutsche Forstverein in Rostock in 1927 are too local in application to be of great value to American readers. Ashe, Garver, Zon, and others have already progressed much further on the same road. The essays show, however, a healthy awakening of German forestry to the problems of forest utilization—an awakening which should prove fruitful of great improvements in forest utilization abroad which American foresters can study with profit.

A. B. Recknagel.

**Forestry.** Journal of the Society of Foresters of Great Britain. Vol. II, No. 1. Edited by H. M. Steven. *Seven Shillings and Sixpence. Oxford University Press.*

The second volume of this periodical contains much which will interest American foresters and is admirable in the variety and form of its material.

The address of R. L. Robinson at the annual meeting of the Society of Foresters of Great Britain held in Edinburgh February 3, 1928, is reproduced in full. It is a splendid summary of progress in current forestry effort. Remarks on ecology, entomology, and growth studies are timely and interesting.

R. S. Pearson's discussion of hardwoods takes up brief comparisons of the properties of home-grown Scotch pine, spruce, and Canadian Douglas fir with home-grown oak, Canadian yellow birch, and teak from Burma. The possibilities for competition by the latter species are more hopeful, the author thinks, because of smaller sizes for equal strength, greater durability, and adaptability to use for manufacturing plywood and built-up members for special purposes.

C. G. T. Morrison and G. R. Clark ably discuss "Some Problems of Forest Soils," emphasizing the need of considering the "interaction between soil and tree growth" in the study of either.

There are a number of thoughtful reviews. One of these by W. R. Day on M. C. Rayner's "Mycorrhiza," is printed elsewhere in this issue at the request of C. G. Bates.

The full contents of the second volume of this new journal follows:

Address to the Society of Foresters, by R. L. Robinson. Hardwoods, by R. S. Pearson. Some problems of forest soils by C. G. T. Morrison and G. R. Clarke. Damage by late frost on Douglas fir, Sitka spruce, and other conifers by W. R. Day. The biology and control of Hylobius abietis by J. W. Munro. Timbers and their condition in relation to Lyctus attack by R. C. Fisher. On the relationship between vessel size and Lyctus attack in timber by S. H. Clarke. The relation of the elm bark-beetles to their host trees by R. C. Fisher. Research in wood structure by J. F. Martley. Theoretical calculation of the pressure distribution on the basal section of a tree by J. F. Martley. Methods of plantation and nursery costing by R. L. Robinson. Chestnut coppice in south-east England by W. L. Taylor. A seventy-year-old plantation on peat by L. A. B. MacDonald. A general review of post-war forestry in Central Europe by Dr. Ing. Franz Heske. Some recent forest problems in Switzer-

land by K. A. Meyer. A bibliography of recent forest literature in Sweden by Sven Petrini.

Reviews—Silvicultural Systems (R. S. Troup) by A. K. Glasson; The anatomy and physiology of the formation of growth zones and annual rings in the tropics (Ch. Coster) by B. J. Rendle. Holznahrung and Symbiose (P. Buchner) by R. Neil Chrystal. Beetles injurious to timber (J. W. Munro) by J. G. Myers. Mycorrhiza (M. C. Rayner) by W. R. Day. Manual of Forest Engineering and Extraction (J. F. Stewart) by F. A. Leete. The Protection of Woodlands (G. W. St. Clair Thompson) by R. N. Chrystal.

S. W. Allen.

**Mycorrhiza.**[1] By M. C. Rayner, D. Sc. Wheldon & Wesley, Ltd., London, 1927. (*New Phytologist Reprint*). *Price 21s.*

The appearance of a general book of reference on mycorrhiza is a matter of importance, for until the present time there has been no work which has dealt adequately with this important and interesting subject. In forestry a mild interest has always been taken in mycorrhiza; but it is only within recent years that there has been any real awakening to the fact that until the biology of the soil and of the relationship of the forest to the soil is understood the economy of the forest can never be truly appreciated, the conditions necessary for the full health of the trees realized, and the maximum profit obtained from the crop. Recent years have seen notable advances in the study of mycorrhiza, and advances which are of great importance to the forester in particular. Nevertheless, little or none of this work could be referred to in English, and the great importance of Dr. Rayner's book is that it gives a full and complete account of the whole subject, which by its publication becomes open not merely to the research student, but to those engaged in administrative and executive duties, and who have little or no time for the detailed study of a numerous and scattered literature.

An excellent feature of the book is that it deals with the subject historically, so that a clear review is obtained of the development of observation and research during the hundred years in which it has been known that fungi are, in certain cases, associated with the root system of the higher plants. The subject is dealt with in three periods. The early period covers the years 1840-80 and is concerned with the observations and speculations of those who first began to realize that mycorrhiza existed. The end of this period is marked by the pronouncement of the theory of symbiosis by DeBary. The second period, 1880-90, is distinguished from the first by the much more accurate conception of what the association of fungus and root really is. During the first half of this second period Kamienski and Frank recognized mycorrhiza as a morphological entity. The theory of beneficial symbiosis between the mycorrhizal constituents was propounded, and Frank divided mycorrhiza into ecto- and endotrophic types. The second half of the period saw the further development of this theory. It became recognized that

[1] Review reprinted from "Forestry," Journal of the Society of Foresters of Great Britain, Vol. II, No. 1.

"humus plants" existed which by the aid of mycorrhiza drew their food to a greater or less extent from the organic remains constituting humus. The cytology of intercellular digestions was worked out, and the way prepared for the third and modern period, 1900-25.

The greater part of the book is occupied with this period, which is marked by partly successful attempts to determine experimentally what exactly is the relationship between the fungus and its host. Thus the functions of mycorrhiza in the Orchidaceæ and the Ericaceæ has now become much clearer. It is known that the host plant definitely benefits from the association with the fungus, and that under natural conditions this association must exist if the host is to develop. The work of Melin on the mycorrhiza of certain conifers has also made it clear that they certainly benefit by the association, and from this it is practically certain that all other trees which develop mycorrhiza also benefit. It is not yet fully determined exactly what the benefits obtained are, but undoubtedly they are all due to the ability of the fungus readily to assimilate complex organic substances of which the host itself could use but little if any. One of the principal benefits is that a supply of nitrogen becomes available to the host, either by nitrogen fixation, as in the case of the Ericaceæ, or by assimilation from humus, as with the mycorrhiza of trees.

Apart from what has been already mentioned, the mycorrhiza of Bryophyta is fully dealt with and also the association of tuberization with fungal infection. In a concluding chapter the physiological significance of mycorrhiza is discussed and a general review and summary given of the evidence regarding its function in the Orchidaceæ, Ericaceæ, and in the mycorrhiza of trees.

It is impossible in a short review to do full justice to a book containing a mass of so detailed information as does this. It suffices to say that it is an indispensable work to any who take up the study of this most interesting subject. The book is well produced, with clear illustrations. An index is provided and a bibliography of the very extensive literature mentioned. The author is to be congratulated on having produced a most useful and necessary work, and one moreover which is not merely useful but also attractive. It may be commended to all foresters as providing that general knowledge without which it is impossible to understand even partly one very important side of forest biology.

W. R. Day.

**Insect Enemies of California Pines and Their Control.** By F. P. Keen, U. S. Bureau of Entomology. *Bulletin No. 7, Division of Forestry, California Dept. of Natural Resources. Pp. 113; Fig. 51. State Printing Office, Sacramento, Calif., 1928.*

There are in print large masses of scientific and technical data on many phases of forestry, but like some soils whose fertility is in a form "not available" for the plant, much of this technical data is "not available" to the nontechnical man. Mr. Keen, in his bulletin, has put into a most useful form a wealth of information on the insect enemies of California pines heretofore scattered in various publications, and has

drawn heavily upon his own already wide experience in the subject to make his bulletin very complete. The style is simple, easy to read and understand, and the arrangement is orderly.

The bulletin begins with an interesting, though brief, chapter on "The Rôle of Insects in the Forest." Then follows "What the Insects Do"—brief paragraphs on bark borers, wood borers, leaf feeders, and sap suckers. Under "The Natural Control Factors and Influences" are considered the factors of environment that may at times favor and at other times inhibit insect life. The chapter on "The Artificial Control of Pine Insects" is particularly important to the timber owner. Here the writer has an opportunity to use his experience gained in combating insect attacks on a large scale. It is evident that control measures to beat back epidemics must be drastic, and that they are costly.

The pine insects themselves are each described in some detail, this part requiring over sixty pages. First come the beetles, then the moths and butterflies, the saw flies, aphids, flies, etc. Under each main group are considered the several families, genera, and species. The introductory paragraphs give the lay reader a clear idea of the basis of the classification. Species descriptions are done in a very systematic manner, *e. g.*, under "Red Turpentine Beetle," are paragraphs on Hosts; How Destructive; How Recognized; Seasonal History; Distribution; and Control; and there are several halftones illustrating the work of the beetle.

In addition to a comprehensive general index there are three so designed and arranged as to form synopses of the typical symptoms of insect injury on California pines and to serve as keys from which the timber owner and forester may determine the insect responsible for the trouble. The first special index is for a "Preliminary diagnosis of primary insect injury in pines"; the second is "A guide to field identification of the more destructive insects attacking California pines," and is based upon the character of the work of the insects; and the third is a "Host tree index of pine feeding insects." These indexes alone deserve particular commendation for their usefulness.

EMANUEL FRITZ.

**Wood and Lumber.** By A. C. Newell, Illinois State Normal University. *Pp. 211, Figs. 22. Manual Arts Press, Peoria, Ill., 1927.*

The opening sentence of the preface reads: "The chapters in this book have been written in reply to searching questions from several thousand bright boys who have wanted information about wood and lumber that is not in available form in the textbooks which are commonly used." And later, ". . . . this volume has been written in order to provide a text and reference book for advanced classes in woodwork." The author then presents a text which is almost encyclopedic, yet superficial, as to the points touched upon in this field. The work is badly organized, incorrect here and there, and in an effort to be original he has produced a book that will be hopelessly confusing to the bright boys craving information. There is a mixture of bits of the most technical knowledge with bits from the minds of "practical" men, and the author frequently allows himself to be sidetracked on irrelevant though in-

teresting facts and statements. Manual training students need the elementary facts of every-day wood technology; for them time spent on excursions into the field of monocotyledons, vascular bundles, primary tissues, protoplasm, etc., might better be spent on making the difference between hardwoods and softwoods more clear. A student reading the first four chapters would be hopelessly at sea unless he has a correct knowledge of botany. Later chapters, with some exceptions, are somewhat better.

There are seventeen chapters as follows: 1. Classes of trees; 2. Parts of a tree, sap movement, and growth; 3. Wood cells; 4. Grosser characteristics and appearance; 5. Waste products (meaning "products from food digestion and other metabolic processes"); 6. Chemistry of wood with industrial applications; 7. Density, weight, specific gravity, and hardness of wood; 8. Seasoning of wood; 9. Moisture content of lumber; 10. Shrinking and swelling of wood; 11. Warping of wood; 12. Durability of wood; 13. Decay of wood; 14. Wood preservation; 15. Lumber classification and grading; 16. Lumber manufacture; 17. Sizes of lumber. One wonders why with such a list of titles there are not also chapters on the forest regions, descriptions of important commercial woods, the uses of wood, and the finishing of wood.

The reviewer regrets that he must report this book so unfavorably. The author picked an excellent subject and a large and important audience. He deserves credit, however, for tackling the job and perusing such a very great list of articles, books, and pamphlets for his information. The book doubtless will have a wide sale in manual training departments, but it is doubtful if, for any but a very few of the teachers in these departments, it will make the "mystery" of wood anything but deeper.

EMANUEL FRITZ.

**Marine Borers and Their Relation to Marine Construction on the Pacific Coast.** Final Report, San Francisco Bay Marine Piling Committee. C. L. Hill and C. A. Kofoid, editors-in-chief. *Pp. 357, illustrations 143, tables 45, map, size 7 x 10½. Published by the Committee, San Francisco, California, 1927.*

This is a contribution of outstanding character to the subject of marine borers. It is a work of great scientific merit on the biological aspects of marine borers and a manual of great usefulness to the engineer in marine works. It is of interest also, of course, to the lumberman and forester because of the great amount of wood consumed annually for marine structures.

The San Francisco Bay Marine Piling Committee came into existence in 1920 following a serious invasion by marine borers of theretofore uninfested waters in the upper reaches of San Francisco Bay. The Committee was composed of engineers directly concerned in the trouble and also others interested in the subject from one angle or another, and at once set out upon a general survey and a comprehensive scientific study of the life histories of the marine borers concerned, and methods of their control. While the work of the Committee was carried on principally in the San Francisco Bay region, the results of its work, as given in

this final report, are of interest and value as well in other regions.

The report is divided into four sections with a total of twenty chapters. The historical section leads, followed by sections on hydrographic, engineering, and biological phases. The historical section outlines the origin and development of the project and the history of development of marine structures in San Francisco Bay.

In the hydrographic section are considered the geography and hydrography of the Bay. The water surface of San Francisco Bay and its arms is about 460 square miles. The fresh water of the Sacramento and San Joaquin Rivers enters the uppermost arm, or Suisun Bay. During periods of low discharge from these rivers, the salt tidal water reaches farther inland, exposing more marine structures to borer attack. It was during a protracted period of such low fresh water that the teredo made its appearance and became epidemic. In another chapter of this section is given a discussion of the possibility of building a barrier across the narrows between San Francisco and San Pablo Bays to separate the fresh and salt waters and to make available a huge body of fresh water to the industries on San Pablo and Suisun Bays.

In the engineering section are chapters on the engineer's responsibility in marine structural problems, marine conditions affecting marine construction, marine structures, marine substructure materials, and service records of piling in San Francisco Bay. One can easily infer from this section that wood will remain for a long time an important material for marine structures and that treatment with coal tar creosote is the most effective protection against borers. "It is likely that no type of structure is subjected to such severe and adverse conditions as that serving in sea water. The superstructure involves all the problems of those built on land, and the substructure, in addition to being constructed on a complex and uncertain foundation, must be capable of resisting the action of tidal currents, waves and storms, impact of ships, abrasion of floating objects, severe weathering action, chemical action of sea water and, in the case of timber substructures, the ravages of marine borers. . . . . While the research work of this committee has centered essentially about borer attack on timber, it has necessarily given consideration to the general subject of marine piling materials, including materials other than timber and which are ordinarily, if not always, immune from borer attack. The availability of timber, its natural adaptability as piling, its comparatively low cost and ease of handling, cause it to rank foremost as a piling material for general use. The borers achieve prime importance because they obstruct the use of this most plentiful and available natural piling material, and not because they constitute a greater problem than any other adverse conditions."

In those portions of a marine structure exposed to alternating periods of wetting and drying the timbers are exposed to attack by Limnoria and to wood-rotting fungi. In lower portions the very destructive teredo becomes active. The attack of Limnoria and fungi is easily visible, but teredo work does not become evident except by closest scrutiny or by cutting into the material. The entrance holes are tiny but enlarge rapidly below the wood surface. Salinity is the governing factor of marine borer attack. "Teredo is particularly destructive in

the lower salinities, from 10-20 parts in 1000, a condition to be found in river estuaries." In the present case marine structures of Suisun Bay were in particular jeopardy because all structures were made of unprotected timber; reduced flow from the rivers, however, permitted the encroachment of salt water and the entry of marine borers.

"The prevailing condition of borer infestation is usually a well-established fact—the borers are known to be either present or absent, and protective measures are either adopted or disregarded. Perhaps the most dangerous situation is the beginning of borer attack in a region previously without it. An infestation is in reality contingent upon two general factors: marine conditions and the presence of timber which can be attacked. The former will control the intensity of infestation, the latter will provide a breeding ground in which it may be established and continued.

"An infestation may be conveyed from one locality to another either by some such agency as driftwood or log-booms, or by water currents which carry the borer larvæ. If unprotected timber exists in a locality reached by such agencies it will eventually be attacked and the infestation established; if no such timber exists, the larvæ will soon perish and any borers in driftwood will die off as soon as the wood is destroyed. A locality near an infestation may remain comparatively free from borers if conveying agencies are absent. A structure may even be built of unprotected timber, in an isolated location, where conditions are suitable for borer life and within a few miles of an infested region, and may remain unmolested or only lightly attacked for some time. The possibilities of a continuance of such immunity are increasingly unlikely, for some chance circumstance is almost certain to bring the borers; and as time goes on other structures are likely to be built in the vicinity, giving a greater amount of exposed timber and increasing the possibility of establishing infestation. Under such conditions the rapidity with which the borers breed will soon make the attack as severe as elsewhere.

"The apparent absence of borers in a locality relatively near an infested region has often led to the mistaken conclusion that prevailing conditions unfavorable to borer life would continue to repel them, not taking into account the fact that such conditions often change."

In addition to salinity, controlling factors are relative purity of the water, depth of water, and temperature. Borer action is greatest in uncontaminated waters, but the committee finds that the degree of protection afforded by sewage has probably been overestimated. Borer action is greater in deep than in shallow water and the attack of teredo is greatest at the mud line. In the case of Limnoria, however, the attack is greatest between tide levels. Borers are known to attack timber in all latitudes, but in general their activity increases with the water temperature.

Chapters VII and VIII are important ones for engineers. They discuss the economic life of marine structures, annual cost, construction practice, design, stresses, the handling of piles, driving, framing, repair and specifications for materials and methods. Timber structures, creosoted, still have a considerable advantage over those of reinforced concrete. The annual cost on creosoted piles is 15.68 cents, as compared to 21.85 cents

for reinforced concrete piles and 32.48 cents for concrete cylinders. One of the most important considerations in the use of creosoted piles is their handling. Since the protection afforded a timber pile is from only a relatively thin layer of creosoted cells, this layer must be protected against injury. It was learned by the committee that many creosoted piles failed because the protecting layer was punctured in rafting, in driving, or in framing. Pile drivers commonly use pike poles and cant hooks. Holes left by such equipment or cuts made for framing permit the teredo access to the untreated wood within. In such a case the creosoting gives a false sense of security. The emphasis laid by the committee on care in handling creosoted piles has resulted in a marked improvement in marine construction practise on San Francisco Bay.

Douglas fir holds first rank as a piling material on the Pacific Coast by virtue of its availability, great strength, and form, and in spite of its refractory behavior in creosoting. The committee's investigation has disproven the theory held by some that California grown eucalyptus, redwood, Port Orford cedar, and western red cedar are immune to marine borer attack. A number of protective coatings, sheathings, and impregnations were studied or tested but apparently none were found so effective as a pressure treatment of coal tar creosote. The report describes each method and its service. Of creosoting, it says: "Notwithstanding the countless efforts of the past to evolve protections for timber piling, none has thus far been developed to give better general service than the creosoting process—meaning by better service a longer length of life in relation to cost."

Detailed specifications for pile and timber materials, preservative materials and treatments, and handling of timbers in construction are given. There is also a section containing specifications for reinforced concrete in marine construction. Concrete structures are not foolproof. Sea water has a deleterious effect upon the concrete itself and a highly corrosive effect upon embedded reinforcing steel.

In Chapter X are reported the chemical investigations of the committee. What the chemists of the committee investigated is suggested by the summary of their conclusions; thus:

"1st. That straight-run or whole creosotes penetrate wood in an unaltered condition; that is, that there is no tendency toward filtration of the heavier constituents in the outer layers of the wood.

"2nd. That there is no fixation of creosote constituents in the wood, and that low boiling substances do not polymerize to any appreciable extent to form high boiling substances.

"3rd. That the loss of creosote from treated wood is due to the combined volatility and solubility of the constituents in the low boiling fractions, and that the loss falls almost entirely on these low boiling constituents.

"4th. That creosote constituents boiling below 235° C., while in general more effective as long as they remain in the wood, are largely lost from treated wood within two or three years, therefore that the percentage of these low boiling constituents in the oil should be limited to the amount necessary for good penetration; also that the tar acid specification should refer to the fractions above 235° C.

"5th. That certain oil tar distillates have a greater protective value against marine borers than that with which they have ordinarily been credited.

"6th. That inorganic substances, by themselves, have little prospect of value in the preservation of marine piling against borer attack.

"7th. That chlorine treatment has no practical value in the protection of piling against marine borers."

During the work of the committee there were proposed by interested people many materials and methods for protecting timber piles. For some, extravagant claims were made. These were investigated and are reported upon in Chapter XI. These tests extended over a period of four years.

The biological members of the committee conducted very intensive scientific investigations, both in the field and in the laboratory. Their work is covered in Chapters XII to XX and marks an event of no small importance to engineers and scientists, *i. e.,* the demonstration of the worth of pure science as an aid to engineering progress. "The natural history of the various species of borer is far from being a matter merely of theoretical or academic interest. It cannot be too strongly emphasized that any method of combating the ravages of these organisms must depend for its success on a recognition of the biological factors involved. It has not infrequently occurred in the past that time and money have been invested in proposed methods of protection, the failure of which could have been predicted by the biologist on *a priori* grounds." The committee laid particular emphasis on the biological aspects of its work. Its report on this phase is therefore "an extended and comprehensive account of the marine borers of the Pacific Coast, and a detailed analysis of the behavior of these organisms in San Francisco Bay during a four-year period."

A classification and key to the identification of shipworms is given in Chapter XIII, while Chapter XIV is devoted to the morphology of the shipworm or teredo, and Chapter XV to its boring habit. *Teredo navalis,* the most malignant of the borers, is a mollusk, closely related to the common soft shell clam. Its shell has been so reduced, however, that it covers only a small portion of the anterior part of the body. The visceral and other portions are so elongated as to make the over-all length as much as 20 inches, a length that may be attained under favorable conditions in 8 months. Boring, it was definitely determined, is accomplished by the shell through a rasping action. The rate of boring may be as much as over 4 cm. per month and, if the attack is a dense one, an untreated wood pile may be entirely destroyed at the mud line in from 5 to 6 months. The question whether or not teredo derives any nourishment from the wood in which it bores has been much debated. The committee's chemists found that some of the cellulose content of the wood, 80% of it, actually disappears on its way through the digestive tracts. This discovery throws some light upon the probable mechanism by which toxic substances injected into the marine timbers protect against marine attack.

The biology of *Teredo navalis* is treated in Chapters XVI and XVII. The committee's experiments indicate that five parts per 1000 are the average lethal salinities, but that a small portion can survive for some time in salinities of four in 1000. Teredo is able to revive rapidly if

after being placed in water of lethal salinity, it is returned to salt water. Waters that have fluctuating salinities, that is alternately fresh and salt, are thus not proof against teredo activity. The data of the committee also indicate that sewage contamination is an unreliable factor in the control of teredo. Chapter XVIII gives notes on the biology of other Pacific shipworms—additional species of teredo, and species of Bankia, the latter better known to foresters as Xylotrya. Chapter XIX discusses the occurrence of rock boring mollusks in concrete. Chapter XX is devoted to Limnoria and its allies. These are crustaceans and unlike teredo reduce the wood from the outside rather than from within, and they work between the tide levels. Their work is thus visible, and while very destructive, the obviousness of their attack renders them less a cause of catastrophic accidents. They bore with their mouth parts and can penetrate not much over ½ inch; they digest much of the wood for their carbohydrate requirements; salinities of 6.5 parts per 1000 are lethal within 24 hours, while salinities of 10 parts per 1000 permit survival for two weeks but are ultimately lethal.

The excellent illustrations with which the report is abundantly supplied add much to the value of the work, especially to the layman not very familiar with the technical phases.

EMANUEL FRITZ.

# NOTES

## "Where Can Timber Be Grown Commercially in the United States?"

Jacksonville, Fla.,
January 24, 1928.

Editor, Journal of Forestry.

Dear Sir:

After reading Mr. K. W. Woodward's article in the January number of the Journal, in which he upsets most of the findings of the United States Forest Service, and others, I was thankful that he did not tackle the League of Nations or the prohibition question.

For audacity and downright courageousness in the enemy's territory I take off my hat to Mr. Woodward. I am sure if he had known about the world war in time he would have saved the Allies a lot of money.

My testimony in this case is necessarily brief, because my first-hand knowledge is confined to about one-half of one percent of the territory covered by the article in question. It has been part of my job for the past few years to check up on the growth and yield of longleaf pine in the southeast. To this end several thousand dollars have been spent taking field measurements in the woods, and competent foresters have labored long and blasphemously over the notes. Some attention has been paid to other species such as slash and loblolly pine, but longleaf is the only one we are sure about under all conditions.

It will not give us much publicity to relate that our findings check very closely with those of the Forest Service as far as fully stocked stands are concerned. This refers to stands which are subjected to periodic fires. We went further with the investigation and decided that if protected from fire the rotation for most products could be cut down from 20 to 25 percent.

This letter is written to cheer up the Forest Service more than anything else. I can appreciate how it must feel to have the accumulations of a life-time swept away and have to start out all over again.

Very truly yours,

S. J. Hall.

Durham, N. H.,
May 21, 1928.

Editor, Journal of Forestry.

Dear Sir:

Thank you for letting me see Mr. S. J. Hall's letter of January 24. I enjoyed particularly his sarcasm and hope that the letter can be published in full in the Journal. His letter was also interesting because he infers that the yield table data on longleaf pine could be applied without a large reducing factor to extensive areas. That is the real question. No one doubts that southern pine, especially slash and loblolly pine, grow fast in the relatively limited bottom-

lands. But do they yield heavily on the uplands? Can fire be held wholly responsible for the openness of the stands in the southeast? If so, why is it that stands of corn are less dense than in the northeast? The corn fields are not burnt over.

It is questions like these that I meant to raise by my article in the January JOURNAL, and I hope that anyone who can contribute to their solution will share his information with the rest of us.

Very truly yours,

K. W. WOODWARD.

## MORE ABOUT SPECIAL SLIDE RULES FOR FORESTERS

Mr. James L. Averell (Jour. For. 26 (5): 722-723, May, 1928) gives a description of the Troell slide rule for forestry computations. After having used one of these rules for over one year the writer finds it very convenient for certain work. It has proven most useful, perhaps, for an operation not mentioned by Mr. Averell, *i. e.,* for computing growth per cent of trees in volume.

The glass index is provided with two cross hairs, the left reading in cubic feet and the right in cubic meters. The two upper fixed scales have likewise two indices, the left for inches and the right for centimeters. To compute growth per cent one places the figure on the movable scale representing the diameter breast high opposite the proper index for the units of measurement used. The cross hair is then placed over the figure on the movable scale representing the width in millimeters of the last 10 annual rings in radius at breast height as determined from the increment core. The figure intersected on the top scale by the cross hair then gives the growth per cent in basal area. The form height growth per cent is then calculated by the formula $p \frac{100.Zh}{H + 2.5}$, where Zh is the length of the leader in meters and H the height of the tree in meters. According to Tor Jonson's formula the sum of these two growth per cents gives the growth per cent of total volume. (Cf. Praktisk Skogshandbok, p. 214, Stockholm, 1924.)

The rule has 12 major scales, and the writer has not mastered all the operations which are possible with the rule. Assistant County Forester Troell states in the booklet accompanying the rule that its accuracy is not as great as machine-made slide rules. He tried without success for some time to interest manufacturers of slide rules to undertake the construction of his rule. Finally, he was forced to make them himself with the assistance of a local photographer in Sollefteå, who photographed the scale on a celluloid compound. The scale, therefore, is not strictly accurate, but sufficiently so for most rough calculations in the field, where the rule is of great use.

This rule has been described by L.——— M.———: "Skogsstickan," Skogen 14 (17): 398-400, 2 fig. 1927; and by J. K. Sandmo: "Ny regnestav for skogsmaend," Tidskrift for Skogbruk 35 (10): 506-507, 1 fig. 1927; as well as a note in Forstlig Tidskrift (Helsingfors), Band XLIV (4), Dec. 1927.

Now comes the announcement of Archer's rule (Langsaeter, A.: Archer's Regnestav. Tidskrift for Skogbruk 36 (5): 287, May, 1928). It is made by Erling Archer, formerly director of the

Norwegian Forest Experiment Station, and now manager of the Trondhjem Communal Forest and Angell Foundation at Selbu, Norway. One of the chief differences between his and Troell's slide rule is that the former is 40 cm. (16 in.) long, which makes it much less convenient to carry. It is first of all a rule for computing compound interest in all its phases, and incidentally value increment for trees and stands. As is well known, the Norwegian foresters favor computation of current annual increment by the use of compound interest formulæ, and this can be accomplished easily by the new rule. It is stated that the graduations on this rule are of accuracy comparable to standard slide rules, thus overcoming the objection to the Troell rule. The writer has not seen this new rule, and cannot give any information on it based on actual experience.

Archer's rule can be purchased direct from the inventor for 15 Norwegian kronor, or the same price as Troell's rule. Troell's rule is also for sale by the Länsjägmästarnas Förening (County Foresters' Association), Stockholm, Sweden, as well as from the maker, Jägmästare Troell, Sollefteå, Sweden.

As far as is known, no similar instrument has made its appearance in the United States, but it undoubtedly would be of value if someone would make up a slide rule more applicable to American conditions and in English units, which, unfortunately, we are still compelled to use. An ordinary slide rule for reading basal areas was in use at the Northeastern Forest Experiment Station a few years ago, but the writer is not aware of other developments along this line. Great reluctance has been shown by the makers of slide rules to get out anything designed for special forestry use. The writer has approached several firms in vain with such requests. Probably they do not feel that the demand warrants special effort along this line, although there are other branches of biology and engineering for which special slide rules are available.

Henry I. Baldwin.

## Remeasuring the Hell Hole Plots in South Carolina

In November, 1905, W. D. Sterrett, of the Forest Service, established four plots in second-growth loblolly pine in Berkeley County, South Carolina, on land of the Burton Lumber Company, now owned by the North State Lumber Company of Charleston, S. C. This area is 45 miles up the Cooper River on typical pine flat. Sterrett reported it as an old field under cultivation eight years previously. It is now (1928) a stand 30 years old. The series of remeasurements in 1910, 1916, 1921, and this year furnish an adequate picture of the development of loblolly trees in an even-aged stand during most of its life. Unfortunately many of the number tags disappeared before the remeasurement of 1928 (just previously to logging), so that a complete analysis of each plot is not possible. However, for 95 trees such a comparison has been made with the following interesting results:

The trees were recorded by diameter classes for each measurement (1905, 1910, etc.). This gave the development of an average tree of each diameter class in terms of the number of inch classes it advanced in each successive remeasurement.

Thus it was found that the trees of the 15-inch class had advanced one inch in diameter since 1921, 1.5 inches from 1916 to 1921, 2 inches from 1910 to 1916, and 2 inches from 1905 to 1910. In terms of diameter attained the record of the 15-inch diameter class is accordingly 1921—14; 1916—12.5; 1910—10.5; and 1905—8.5 inches, d.b.h.

Similar data for each present diameter class, 7 to 16-inch d.b.h. inclusive, were plotted and the harmonized values of diameter class progression read therefrom.

Diameter b.h. Class Progression, 2d Growth Loblolly Pine, U.S.F.S. Plots 905-908 Inclusive, Berkley Co., S. C. Basis: 95

| 1908 10 ins. | 1913 12 ins. | 1918 14 ins. | 1923 15 ins. | 1928 16 ins. |
|---|---|---|---|---|
| 10 | 12 | 13 | 14 | 15 |
| 9 | 11 | 12 | 13 | 14 |
| 8 | 10 | 11 | 12 | 13 |
| 8 | 9 | 10 | 11 | 12 |
| 8 | 9 | 9 | 10 | 11 |
| 8 | 9 | 9 | 10 | 10 |
| 7 | 8 | 9 | 9 | 9 |
| 7 | 7 | 8 | 8 | 8 |
| 6 | 6 | 7 | 7 | 7 |

From this it appears that with a "spread" in 1908 of 4 inches (6 to 10 ins., d.b.h.), the divergence in rate of growth has resulted in a "spread" of 9 inches (7 to 16 ins., d.b.h.) by 1928. It would, therefore, be a hardy prophet who could say of an 8-inch tree in 1908: "You'll be 12 inches in twenty years hence," whereas the data show it might be either 10 ins. or 13 ins. or anywhere between. Trees do not have pituitary glands (so far as we know), but their individual growth tendencies will be served, just as in humans!

There is the important factor of mortality: For plot 907 the 156 loblolly trees over 2.6 ins. d.b.h. measured by Sterrett in 1905 have shrunk to 57 in 1928. For plot 908 of the 182 in 1905 only 51 are alive in 1928. Each of these plots is ¼ acre in size. Plot 908 was thinned before remeasurement in 1905, whereas 907 was left intact. Sterrett believed that the heavy mortality he found in 1910 and 1921 was due to insects breeding in the slash left on the ground after thinning. Be this as it may, the standing dead trees in plot 907 number only 3 in 1928, whereas in plot 908, there are 14.

That the stand is badly understocked is shown by comparison with the southern pine yield tables. The local site index is "90." At 30 years there should be 420 trees per acre. Plots 907 and 908 together total only 108 living trees on a half acre, or 216 on an acre. Similarly, there should be 3850 cubic feet per acre at age 30 years. Plots 907 and 908 together have only 1394 cubic feet on a half acre, or 2788 cubic feet per acre, after the cut of 1928.

Space does not permit further data being presented here. The remeasurement by Cornell foresters in April, 1928, was indeed timely, as the axe of the lumberman had already reached the plots. The cutting, however, will be most conservative. A diameter limit of 14 ins. at 14 ins. above ground is observed, and of the total cubic contents only 40% is removed in the cut.

Further details are given in the current issue of "The Wood Universal," house organ of the North Carolina Pine Association.

A. B. Recknagel.

## New Douglas Fir Yield Tables[1]

It would be unfortunate if American foresters overlooked the results of McArdle's long-time researches in second growth Douglas fir yields (Washington, Oregon, and British Columbia). A comprehensive bulletin is promised within a year or so. Meanwhile, this thorough-going study of the timber growth potentialities of the forest lands of the West Coast is of such outstanding importance that Director Munger did well to publish the results in condensed form.

Based on 2052 sample plots, varying in age from 20 to 160 years, "every possible combination of soil and climatic factors was considered, localities of moderate and those of very heavy rainfall, gravel soils, clay soils, loam soils; and from sea level to altitudes of over 3000 feet."

The yield tables are for five site quality classes based on the average total height of the dominant and co-dominant trees. Site index is the height at 100 years.

A. B. Recknagel.

[1] "Rate of Growth of Douglas Fir Forests," R. E. McArdle, Pacific North West Forest Experiment Station, reprinted from West Coast Lumberman, May 1, 1928.

## Dedication of the New York State Ranger School Building

The formal dedication of the new quarters of the New York State Ranger School at Wanakena, New York, on August 24, 1928, was indeed a red letter day in the history of that institution. It marked the culmination of the labor and thought of all who have been connected with the Ranger School for several previous years.

Approximately three hundred people assembled for the dedication ceremonies, including Chancelor Flint, of Syracuse University, and members of the board of trustees, practically the entire faculty of the College of Forestry at Syracuse, representatives from several forest schools, forty-four alumni, and two former directors.

It would be entirely out of place to give even a brief summary of the various addresses, but a few ideas variously expressed by the different speakers are worth mentioning. The importance of timber as a basic resource was emphasized. If we are to continue to enjoy our present high standard of living adequate provisions must be made to preserve, prolong, and protect our present supplies of timber. Secondly, no means should be spared to replace forests on the millions of acres which are not even paying their way, to say nothing of producing a revenue. The service that New York State is rendering to the profession of forestry in providing and maintaining a ranger school of such high caliber where men may be well trained to carry on in the field of forestry was heartily and sincerely recognized.

The building is a two-story concrete structure with a slate roof, located upon a high bank overlooking the Oswegatchie River. The central portion of the building is occupied by the offices of the faculty, club room for students, library, lecture rooms, drafting room, instrument room, and laboratories. The wing and a part of the central portion provide rooms for students, dining room and kitchen, and two apartments for members of the staff.

The appointments of the building are thoroughly modern and adequate. An

excellent heating system, abundant hot water supply, and ample toilet and bathing facilities are provided. All floors are covered with battleship linoleum. The lighting, both natural and artificial, is all that could be asked for. The equipment provided for instruction and comfort of the students gives all an opportunity to do more and better work.

Perhaps no one present realized more fully the progress that had been made than the first director, P. T. Coolidge. The beginning in 1912 furnished the material for comparisons which were keenly evaluated by the man who was on the ground at the start. He could recall the hard days of sixteen years ago and view, as a result of his pioneering, an institution which has made a place for itself in the field of forestry.

The New York State College of Forestry is to be congratulated upon having a Ranger School which is second to none. With such excellent facilities and equipment the New York State Ranger School has an opportunity to enhance its already enviable reputation in the field of secondary education in forestry.

ROBERT CRAIG, JR.

## THE KAPUR (CAMPHOR) TREE OF MALAYA

There is little knowledge concerning the silvicultural management of tropical evergreen forests, the so-called "Rain Forests" of Schimper. Such information as is available applies mainly to the deciduous or partly deciduous forests, the so-called "Monsoon Forests." This is especially true of the teak forests of Java and the sal forests of India, where the dry season is pronounced and the forests nearly pure. "Rain Forests," on the other hand, are usually more complex, so that silvicultural management of such forests is much more difficult and expensive.

However, as has been pointed out by foresters who have made studies in the forests of Borneo, Sumatra, Malaya, Burma, and parts of Siam, the predominant element in the otherwise complex forests is composed of one family of large trees. In fact, the complexity is due more to the smaller trees than to those that reach large size and therefore form a large proportion of the stand. Studies made in Borneo, the Philippines, and Malaya indicate that from 60 to 90% of the volume of the forests that cover the lower, usually non-swampy lands and the lower slopes of the mountains up to 1500 to 2500 feet are produced by trees of one family, the *Dipterocarpaceæ*. Some of the woods of this family of trees are known in the United States as "Philippine mahogany." There are different types of the dipterocarp forests, just as there are of the oak forests in the United States, where one or two or three species form the bulk of the timber contained therein. As pointed out by Foxworthy, in his "Commercial Timber Trees of the Malay Peninsula," one of the dipterocarps, *Dryobalanops aromatica,* known in Malaya as kapur (camphor), makes up a large part of the volume of the forests over considerable areas, and sometimes as high as 90% of the stand of timber in such forests is composed of this species.

While on a recent trip to investigate the rubber plantation industry of Malaya, at the suggestion of G. E. S. Cubbitt, Conservator of Forests, and in company with Dr. Foxworthy, Forest

Research Officer, I had the pleasure of inspecting the effect of the silvicultural management of one of the kapur forests under control of the Forest Department of the Federated Malay States. This trip, together with notes and photographs furnished by Mr. Cubbitt, is the basis of this note.

It seems that the kapur tree has a wide distribution throughout Malay, Borneo, and Sumatra. Throughout its range it has the general Malay name of kapur or kapoer. While it has a wide range in Malaya, the kapur type itself is restricted to 350,000 acres, where the stands of this tree reach from 60 to 90% of the total merchantable timber. Kapur is one of the largest trees in Malaya. It is often more than 200 feet in height, with slightly tapering bole up to 100 feet. Generally, the crown occupies about one-third of the height.

While the kapur is found abundantly in the eastern half of the Malay Peninsula, there is a small isolated stand of this type in the western half. It is this stand that has been brought under intensive management. It lies 16 miles north of Kuala Lumpur, the capital of the Federated Malay States. From Kuala Lumpur one passes by auto on an excellent road lined with rubber plantations, until the Kanching forest reserve is reached. The reserve is a small one containing 1180 acres, of which 332 acres contain natural kapur. In this reserve there are 17 sub-compartments, of which 9 contain kapur. In 1892 all kapur trees were reserved from felling. This reservation probably saved the trees from being totally destroyed, but since the boundaries of the reserve, under the land enactment, were not fixed until 1897 and not transferred to the Forest Department until 1914, there was much exploitation prior to that date.

In 1910 improvement fellings were begun and continued every two or three years until 1919. These were initiated to improve the growth of the valuable trees. Before such fellings were started, regeneration was very poor, seedlings being suppressed chiefly by the bertam palm (*Eugeissonia tristis*). In 1916, an even-aged forest of practically pure camphor saplings, 2500 to 3000 to the acre, was the result. Now the crop is a pure, uneven-aged stand of kapur. Practically nothing else grows but kapur. In 1926 and 1927, the stand was so thick that thinning in the young forest became necessary, and in some sub-compartments the mature trees have been felled and the regeneration is free.

Foxworthy states that the growth is rapid. Measurements of 384 trees show that up to the time the tree is 12 feet in girth, the average annual girth increment was 1.05 inches per year. A small plantation 28 years old near Kuala Lumpur contains 268 trees with an average girth of 34.6 inches and an average height of 72 feet.

In closing, it should be pointed out that this tree, while furnishing some camphor, is not the one that supplies the true camphor and camphor wood of Japan and Formosa. Small quantities are put on the market, but the quality is different. The wood is a valuable one. It is much used for house construction in Singapore and elsewhere. When fresh cut, it gives off a strong odor of camphor but soon loses it. Among the Chinese it is valued highly for coffins.

H. N. Whitford.

## University of Idaho Establishes Forest Experiment Station

Operating as an independent division of the University of Idaho on a basis similar to that of the Agricultural Experiment Station, forest research has been definitely undertaken as a major activity of the School of Forestry. Previous to this time a good deal of research has been done, but it has been charged principally to the teaching activities. Among the early research undertaken by the School of Forestry was the investigation of the recovery of by-products from stumps and other forms of wood waste. Studies were also made for the State Department of Public Works to determine the best means of handling certain state lands.

Under the new arrangement research work will be centered at the Forest Research Laboratory and the Experimental Forest. The laboratory is given over largely to the study of wood utilization projects and forest pathology. It also offers opportunity for original research by students. The experimental forest of 640 acres located in Moscow Mountains will be augmented by additional tracts selected within easy reach of the University. The arboretum and forest nursery are to constitute a part of the experimental forest.

Some thirty projects are included in the initial program of the station, among which are forest management as a method of blister rust control, cause and prevention of sap stain in lumber, growth and yield of western yellow pine, methods and cost of slash disposal, effect of logging on the growth and form of residual species in the western white pine type, and the influence of windbreaks on the growth and yield of farm and orchard crops.

The station staff consists of:

Frederick J. Kelley, Ph. D., President.

Francis G. Miller, M. F., Director.

Ernest E. Hubert, Ph. D., In Charge, Forest Research Laboratory.

Thornton G. Taylor, M. F., Silviculture.

Harry I. Nettleton, B. S. (Forestry), Mensuration.

Erwin G. Wiesehuegel, B. S. (Forestry), Wood Technology.

Arthur M. Sowder, M. S. (Forestry), Forest Extension.

C. L. Price, Forest Nurseryman.

Pauline W. Bickley, Secretary.

## Survey of Game Resources

A survey of American game resources has been undertaken by the Sporting Arms and Ammunition Manufacturers' Institute. Its purpose is to collect the experience and ideas of sportsmen and other conservation agencies as to the best ways and means for inducing the sustained production of game crops. By assembling the facts and making them available to sportsmen and land-owners, the sponsors of the survey hope to stimulate the formulation of an effective program of game restoration.

The survey is premised upon the idea that the sportsman, the land-owner, the manufacturer of sporting equipment, and the public each have a stake in the maintenance of a permanent game supply, and that their identity of interest can be made the basis of effective joint action, once the underlying biological, economic, and social facts are made available.

Aldo Leopold has been engaged by the Institute to conduct the survey. He is a graduate of the Yale School of Forestry, with wide experience in the administration of forests, game, and other outdoor resources, and in conservation research. During 1912-13 Leopold was Supervisor of the Carson National Forest; from 1919 to 1923 he was in charge of fire control and field personnel in the Southwestern National Forest District; and from 1924 to July, 1928, was Associate Director of the Forest Products Laboratory at Madison, Wisconsin.

## Definite Association Succeeds American Engineering Standards Committee

After ten years of experiment as the American Engineering Standards Committee, a proposition has been put up to the member bodies, which include the society of American Foresters, to inaugurate a federation of organizations under the name American Standards Association.

According to the statement of William J. Serril, Chairman of the Committee, the purpose of re-organization is to increase the efficiency of the committee work and to facilitate adequate financing.

The interest of the Society of American Foresters in this work centers about the clearing house feature of the new Association as a place where attempts to standardize measurements, methods, specifications, etc., may go forward in an orderly manner with the least duplication of effort.

## Douglas Fir Plywood Institute

Announcement is made of the formation of the Douglas Fir Plywood Institute, with offices in Tacoma, Washington. The objects of the Institute are, in part, to encourage and increase the use of Douglas fir plywood in the United States by cooperative advertising; to establish and maintain such lawful trade customs and usages for the protection of the members as the Association may deem advisable; to collect and disseminate statistics concerning the Douglas fir plywood industry; to establish uniform grades and standards of products; to provide architects, dealers, and builders with an organized and always available guarantee of quality; and to constantly improve methods of manufacture.

An official inspection service has been started, and standard grading rules for Douglas fir plywood adopted. It is anticipated that the standardization of grading and grading rules will place Douglas fir plywood on a par with other standard products of the country and will eliminate the confusion caused by many different grading standards.

The establishment of a research laboratory is stated to be one of the most important features of the Institute. Experienced chemists and practical men will combine their efforts in this laboratory to find a method of producing plywood that will give long and satisfactory service under strenuous conditions.

## Meeting of Phi Sigma Society

The honorary biological society, Phi Sigma, will offer a scientific program at the New York meeting of the American

Association for the Advancement of Science on December 27, which will be open to junior research workers, whether members or not, in any field of biological science. While it is not contemplated to lower the standard of excellence in any way, it is recognized that there are often younger investigators who have produced meritorious results but who are not for various reasons eligible to section programs or to the programs of the more advanced societies. It is the purpose of this society then to offer a place where such investigators may present such work. This plan has the approval of the A. A. A. S.

The Council of Phi Sigma will offer a prize of at least $50 for the most meritorious paper presented on this program by a non-member. Those wishing to present papers should report their intention to the Secretary, Dr. C. I. Reed, Baylor University, Dallas, Texas, not later than November 15, 1928, and should submit a brief abstract not exceeding 250 words. Authors need not be present, but may delegate the reading of a paper to some one who will be in attendance. The Council reserves the right to place any paper on a list to be read by title. Papers will be limited to 10 minutes. So far as possible, all papers of any merit will be admitted to the program.

C. I. Reed.

## Centenary of Forestry Education in Sweden

In October, 1928, Sweden celebrates the 100th anniversary of technical forestry education. Exercises will be held at the Royal Forest High School near Stockholm, to which representatives of forestry education in other lands have been invited. To commemorate the occasion a special de luxe number of the Journal of the Swedish Forestry Society will be issued, containing articles by the present staff of the school. While the main text will be in Swedish, each paper will be accompanied by a résumé in English, French, or German. This number will contain between 500 and 600 pages and numerous illustrations.

H. I. Baldwin.

## Schlich Memorial Fund

In view of the great services of the late Sir William Schlich to the cause of forestry, it was felt after his death that his numerous friends, as well as others who were not personally acquainted with him, would welcome an opportunity of perpetuating his name. With the object of raising funds for this purpose, a committee was formed early in 1926, consisting of the following members:

Lord Lovat, Chairman of the British Forestry Commission, Chairman.

Sir John Stirling Maxwell, representing the Empire Forestry Association and the Royal Scottish Arboricultural Society.

Mr. Leslie Wood, representing the Royal English Arboricultural Society.

Mr. R. L. Robinson, Forestry Commissioner.

Sir Peter Clutterbuck, formerly Inspector General of Forests, India.

Mr. A. Rodger, Inspector General of Forests, India.

Professor R. S. Troup, Professor of Forestry, University of Oxford, and Director, Imperial Forestry Institute.

The following names were subsequently added:

Colonel W. B. Greeley, Forester, Forest Service, U. S. A.

Mr. E. H. Finlayson, Director of Forestry, Ottawa, Canada.

In June, 1927, Lord Lovat, on relinquishing the Chairmanship of the Forestry Commission, resigned the Chairmanship of the Schlich Memorial Fund Committee, and was succeeded by Lord Clinton.

Professor Troup has acted throughout as Secretary to the Committee, and has been assisted by three local Secretaries, Mr. A. Rodger (India), Colonel W. B. Greeley (U. S. A.), and Mr. E. H. Finlayson (Canada).

An appeal for subscriptions met with an immediate response, and the total sum raised up to date (June, 1928), is £1725, of which £278 has been subscribed in the United States of America. Subscribers were invited to express opinions as to the form of the memorial, and many useful suggestions were received. After giving the fullest consideration to these suggestions, the Committee finally decided:

(1) To ask the Forestry Commissioners to set apart an area of forest, to be named the Schlich Forest, situated if possible within easy reach of Oxford and to be available for experimental work; in this area a group of oak trees to be planted and maintained in memory of Sir William Schlich. The Forestry Commissioners have agreed to this proposal, and have the matter in hand.

(2) To have a bronze portrait plaque of Sir William made and erected in the School of Forestry, Oxford. An order for this plaque, at a cost of approximately £24, has been placed.

(3) To place in trust and invest the balance of the sum subscribed, after paying incidental expenses, and to devote the annual proceeds to the payment of an annual personal grant for the furtherance of study or research in forestry; the grant to be awarded by the trustees to different parts of the British Empire and to the United States of America in rotation, the trustees being given discretionary power in the selection of the country in which the award is to be made in any year, and being guided by recommendations received from the country concerned.

In regard to the formation of a trust under (3) above, the Empire Forestry Association, at the request of the Committee, has undertaken the future supervision of the Fund, and the Association's legal adviser, Mr. Ernest Salaman, has drawn a trust deed under which three trustees are appointed, namely the Chairman and Vice-Chairman of the Association and the Professor of Forestry, University of Oxford.

Henceforth business relating to the Schlich Memorial Fund will be transacted through the Secretary, Empire Forestry Association, 22, Grosvenor Gardens, London, S. W. 1. In relinquishing their temporary duties the Schlich Memorial Fund Committee desire to record their warm appreciation of the generous response made to their appeal for subscriptions.

R. S. Troup,
*Secretary, Schlich Memorial Fund Committee.*

### Foresters Receive Honorary Degrees

The honorary degree of Doctor of Science was conferred last spring on E. A. Sherman, by Iowa State College; on E. H. Clapp, by the University of Michigan; and on S. T. Dana, by Syracuse University.

### Haasis Goes to University of Idaho

Dr. Ferdinand W. Haasis, formerly of the staff of the Appalachian Forest Experiment Station, Asheville, North Carolina, has accepted a position as Associate Professor of Forestry at the University of Idaho and Associate Forester at the Idaho Forest Experiment Station.

### Lodewick Goes to Virginia Polytechnic Institute

Dr. Elton Lodewick, who has been an assistant professor in wood technology at the New York State College of Forestry, Syracuse, will have charge of the new course in wood technology and wood utilization to be offered for the first time this year at Virginia Polytechnic Institute, Blacksburg, Virginia. It is understood that Dr. Lodewick will undertake some research, looking to the promotion of more general use of Virginia woods.

### James G. Peters

As this issue of the Journal goes to press word is received of the death of Mr. James Girvin Peters, a member of the Executive Council and a forester known and loved by members of the Society throughout the country. Mr. Peters died suddenly on Tuesday, October the ninth at Camden, Arkansas, where he had gone to address a forestry meeting. Full details of his death and appreciation of his work as a forester will be published in the November issue of the Journal.

### Lauri Ilvessalo

Finnish forestry and science suffered a great loss in the death of Lauri Ilvessalo on April 4, 1928, in the prime of life.

Dr. Ilvessalo was born in Tampere on June 12, 1887, took his degree in forestry at Helsinki University in 1910, and became a candidate of philosophy in 1917 and licentiate of philosophy in 1923. As soon as he had become a master of forestry, he was appointed assistant in silviculture at Helsinki University, and retained this post for three years. From 1912 to 1917 he edited the proceedings of the Finnish Forestry Association and its review. After undertaking various kinds of practical work in 1917 and 1918, he returned to the University in the latter year as a professor of silviculture. This work he carried on without interruption for ten years, besides which he lectured for some years on forest policy.

Dr. Ilvessalo was a prominent and popular teacher, and also a gifted and industrious research worker. This work he carried out mostly within the Society of Forestry in Finland, of which he was archivist from 1913 to 1925, vice-president in 1925, and president in 1926. As an independent research worker, Lauri Ilvessalo was one of the pioneers of Finnish forest science. He is the author of numerous publications,

chiefly in the fields of dendrology and silviculture, and at the time of his death was preparing an extensive work on the forest resources of the world.

Lauri Ilvessalo had an unequalled knowledge of the literature of forestry, and as a teacher and scientist developed into a rare expert in the whole sphere of forestry. As an example we may cite his review of forest research in Finland, published in 1926, which is without rival as a reference work in bibliography in any sphere. He also drew up a scheme for developing forest research work, on the basis of which the Forest Research Institute in Finland was considerably extended. His last work was an exhaustive description of forestry as a whole, included in "Agriculture and Forestry," a work published in several parts.

In order to extend his knowledge and obtain wider views, Lauri Ilvessalo undertook a number of journeys abroad. With his lovable qualities he made many friends, and is largely responsible for the lively cultural intercourse existing at present between Finland and many other countries. At the time of his death he was planning an extended journey to North America, funds for which had already been set aside by the Finnish Academy of Science.

In many respects Lauri Ilvessalo was a pattern of a true scientist: silent, modest, thoroughly devoted to duty and industrious, but, when necessary, of a ready wit and in moments of enthusiasm characterised by a refined humor. His numerous lectures and speeches were frequently splendid and contained clear expositions of the work in hand. Thus, his last lecture, his last message from his bed of sickness to Finnish foresters, ended with these prophetic words: "Beyond our highly developed forest management there shines for us as our goal an economically, culturally, and nationally powerful Finland."

N. A. Hildén.

# SOCIETY AFFAIRS

### Revision of the Constitution

*To the Membership of the Society:*

The revised Constitution herewith presented to the Society is recommended by the Executive Council for adoption. This is obviously a matter of leading importance to the Society, and every voting member is urged to give it prompt and thorough attention. A ballot form will shortly be issued for your action.

The diversified and widely distributed character of the Society's membership has brought up some difficult questions. In a Society such as ours, which is neither entirely technical nor entirely scientific and the members of which are so scattered geographically, it is not easy to provide smooth and easy going in every particular. The Executive Council does not consider the present draft perfect. It believes, however, that it will meet the growing needs of the Society in a far greater degree than the present Constitution. Time alone will determine whether certain provisions are adequate or the best that can be devised. Many of the provisions are so linked together that the Council has voted to present the revised Constitution for adoption as a whole, rather than section by section.

The revision of the Constitution has been under way for over three years, and the thanks of the entire Society are due to the committee which has had the matter in charge. This committee, consisting of E. H. Frothingham, Chairman, E. Fritz, L. S. Murphy, and C. R. Tillotson, has done an exceptionally difficult, painstaking, and constructive piece of work. Its first completed recommendations were published in the October, 1927, Journal, for criticism by the Society at large. A number of suggestions were received, and these, with the supporting arguments, were acted upon by the Committee. A new draft was prepared and submitted to the Executive Council, which has acted, by vote, upon all recommendations of the Committee and upon the few points upon which the Committee was divided.

It is noteworthy that there was unanimous agreement in both the Committee and the Council upon most of the major changes, such as the adoption of the Hare system of proportional representation[1] and the size, term of service, and biennial election of officers and Council. It should be noted that while the office of Secretary-Treasurer is retained (as appointive from among the elected members of the Council), the routine duties of these combined offices are expected to be performed by paid executive assistants.

The members are urged, before submitting their action, to read the proposed draft carefully and to compare it with the present Constitution, which will be found on pages 1083-1090 of Volume 15 (1917) of the Journal of Forestry. The latter was also printed

[1] Attention is called to the article on the Hare System in this issue of the Journal.

in pamphlet form in September, 1922, as revised to that date.

Article XI of the present Constitution, as recently amended, provides that the Constitution "may be amended by letter ballot by a three-fourths vote of the members voting, provided the proposed amendments have been submitted to all Members, Senior Members and Fellows at least four (4) weeks in advance." The ballot will follow in accordance with this provision.

For the Executive Council,
Ward Shepard, *Secretary*.

## Text of Revised Constitution

### *Article I: Name*

The name of this Society shall be Society of American Foresters.

### *Article II: Object*

The object of this Society shall be to advance the science, practice, and standards of forestry in America.

### *Article III: Membership*

Section 1: The membership of the Society shall consist of Junior Members, Senior Members, Fellows, Associate Members, Corresponding Members, and Honorary Members.

Section 2: Senior Members and Fellows shall be, at the time of their election, citizens of the United States, its possessions, Canada, or Newfoundland. Junior Members and Associate Members shall be, at the time of their nomination for membership, citizens of the above-named countries or shall have declared, in a legally accepted manner, their intention of becoming citizens.

Section 3: Junior Members shall be graduates of a school of forestry approved by the Council; or in lieu of such training they shall show proof of at least six years' creditable experience in forestry; *provided,* that one semester of junior, senior, or graduate work of a satisfactory character in a school of forestry approved by the Council, or one year of study in subjects preparatory to forestry, shall be regarded as equivalent to a year of experience. If not engaged in actual forestry work, the candidate for election to this grade must show proof of having one of the two above qualifications and of retaining an active interest in forestry.

Section 4: Senior Members shall be elected from the Junior Members of the Society and shall have had at least ten years' experience in forestry; *provided,* that one semester of junior, senior, or graduate work of a satisfactory character in a school of forestry approved by the Council, or one year of study in subjects preparatory to forestry, shall be regarded as equivalent to a year of experience. Advancement shall not be automatic but shall be based on demonstrated capacity to plan and execute important work in forestry. Senior Members shall be engaged in forestry work at the time of election.

Section 5: Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character. They shall be elected from the Senior Members, and shall be engaged in forestry work at the time of their election.

Section 6: Associate Members shall be persons not foresters who have shown substantial interest and have participated in the advancement of forestry, and who are generally known to the profession throughout a wide geographic region.

SECTION 7: Corresponding Members shall be foresters who are not citizens or residents of the United States, its possessions, Canada, or Newfoundland, but who have shown substantial interest in American forestry. Professional qualifications for this grade shall be equivalent to those for the grade of Senior Member.

SECTION 8: Honorary Members shall be (*a*) persons not foresters who have rendered distinguished service to forestry either in America or abroad, or (*b*) professional foresters of outstanding achievement whose field of work lies outside of, and who are not citizens of, the United States, its possessions, Canada, or Newfoundland.

SECTION 9: Junior Members, Senior Members, and Fellows, if in good standing, shall be entitled to vote on any question before the Society as a whole, except that only Senior Members and Fellows shall be entitled to vote upon the candidates for Fellow. Other classes of members may attend any meeting of the Society and take part in the discussions, but shall have no vote.

### *Article IV: Admissions and Terminations of Membership*

SECTION 1: All admissions to the Society and advancements from the grade of Junior Member to that of Senior Member shall be by vote of the Council. Eight affirmative votes of the Council shall be necessary to admit any candidate or to advance any Junior Member. At least one month prior to action by the Council, the names of all candidates proposed, with a statement of their qualifications, shall be referred to the entire voting membership for comment or protest.

SECTION 2: Nominations for all grades of membership except Fellow shall be endorsed either by a section of the Society, where a section exists, or otherwise by three voting members, and shall be submitted in writing, with complete evidence of qualification, to the secretary-treasurer.

SECTION 3: Nominations to the grade of Fellow shall be made by eight affirmative votes of the Council or by the written endorsement of twenty-five Senior Members or Fellows.

SECTION 4: Advancement from the grade of Senior Member to that of Fellow shall be by letter ballot of the Senior Members and Fellows. An affirmative vote of three-fourths of those voting shall be necessary to elect.

SECTION 5: Charges of conduct unbecoming a member, when submitted in writing by five or more voting members, shall be investigated without delay by the Council. Final action shall be taken promptly but only after thorough investigation and after reasonable and specified time has been given the accused to prepare and submit a written defense. A vote of at least eight members of the Council shall be necessary to reprimand, suspend, demand the resignation of, or expel the member in question.

SECTION 6: Conditions under which membership may be terminated or former members reinstated shall be defined in the by-laws.

### *Article V: Dues*

SECTION 1: An entrance fee of $5.00 shall be assessed upon admission to the grade of Junior Member.

SECTION 2: The annual dues of Fellows and Senior Members shall be $8.00, of Junior Members $6.00, and of Asso-

ciate Members $5.00. In each case $4.00 shall be in payment of subscription to the official publication of the Society. Corresponding Members and Honorary Members shall not be charged dues.

SECTION 3: Annual dues shall be payable from the first day of January. Members in arrears on September 1 shall be declared in bad standing and shall forfeit from that date, until their dues are paid, the right to vote, to be elected to office, or to receive the official publication of the Society. Entrance fees and dues of newly elected members shall be payable upon their acceptance of election to membership. Members elected after July 1 shall be charged half of the annual dues for the year. The Council may remit the dues of any member for any special reason as provided in the by-laws. No member of any grade shall be entitled to any return of fees or dues upon severance of his connection with the Society.

### *Article VI: Officers*

SECTION 1: The officers of the Society shall be a President, a Vice-President, and a Secretary-Treasurer.

SECTION 2: The President and Vice-President shall be elected from the Senior Members and Fellows as provided in Article VIII, and shall serve for two years from January 1, or until their successors are elected. The Secretary-Treasurer shall be appointed by the President, with the approval of the Council, from among the members of the Council.

SECTION 3: The President shall preside at meetings of the Society, shall be chairman of the Council, shall appoint such committees as may be approved by the Council, and shall perform all other duties incident to his office.

SECTION 4: In the absence of the President, or in his inability to act, his duties shall be performed by the Vice-President. In the event neither can serve, the Council shall appoint a president pro tempore.

SECTION 5: The Secretary-Treasurer shall be responsible for the keeping of the minutes of meetings and other records of the Society, for collecting all monies due the Society, which he shall deposit and expend only as directed by the Council, and for the performance of all other duties incident to his joint office.

### *Article VII: Council*

SECTION 1: The Society shall be governed by a Council comprised of the President, Vice-President, retiring President, and eight elected members.

SECTION 2: The eight members of the Council, other than the President, Vice-President, and retiring President, shall be elected from the Senior Members and Fellows as provided in Article VIII, except that the four elected members of the present Executive Council, whose terms do not expire at the end of the calendar year in which this section is adopted, shall continue to serve for two years from January 1 following its adoption. Four members shall be elected every other year beginning with the year in which this section is adopted, and shall serve for four years from January 1, or until their successors are elected.

SECTION 3: The Council shall control the funds of the Society, shall choose the Editor-in-Chief, shall have the power to fill any vacancies occurring in its number or in any office not otherwise pro-

vided for, and shall discharge such other executive duties, not specifically provided for otherwise in this Constitution, as are necessary for the attainment of the objects of the Society and for the proper conduct of its business. It shall elect persons to membership in the Society in each grade except Fellow as provided in Article IV, Section 1. The Council shall receive and act upon charges preferred against any member of the Society, as provided in Article IV, Section 5. The Council shall have power, by vote of at least eight of its members, to draft and establish by-laws for conducting the affairs of the Society in matters not provided for herein, but no such by-laws shall abrogate or be inconsistent with any part of this Constitution. Any action of the Council may be brought before the Society at large on written petition of not less than fifty voting members. Six members of the Council shall constitute a quorum.

### *Article VIII: Nomination and Election of Officers and Council*

SECTION 1: A nominating committee shall be appointed by the President, with the approval of the Council, not later than August 1 of the year in which an election is to be held. It shall be the duty of this committee (1) to nominate candidates to the extent of not more than twice the number of positions on the Council, including officers, to be filled at the forthcoming election; (2) to receive nominating petitions from the membership at large as provided in Section 2; (3) to cause to be distributed to the entire membership, at least ten weeks before the date of election, in the official organ of the Society or otherwise, its own nominations and any nominations by petition that may then be available, *provided* that no person shall be listed as a candidate at any time until the committee has received his written acquiescence; (4) to set the date of election, and announce it to the Society at least ten weeks in advance; and (5) to instruct the Secretary-Treasurer to submit during the sixth week prior to the date of election, to the voting membership for letter ballot, all nominations made by the nominating committee or by petition.

SECTION 2: Nominations by petition shall be subject to the following conditions: (1) each petition shall name but one candidate; (2) all candidates must be eligible to hold elective office, including membership on the Council; (3) a petition shall bear the signatures of at least ten voting members of the Society who at the time of signing such petition are eligible to vote in the forthcoming election and who have not already signed a petition for any other candidate to be voted on at the same election; (4) petitions must be in the hands of the nominating committee by the end of the seventh calendar week prior to the date of election.

SECTION 3: All elections shall be by the Hare system of proportional representation. Candidates for membership on the Council, including all elective officers, shall be voted for in one group. The initial ballot count of such vote shall be conducted according to the usual quota method of the Hare system in such a way as to fill all Council positions, including officers, necessary to be filled at such election but without distinction as between the various positions. The successful candidates in this initial ballot count shall be declared members elect of the Council and as such become continu-

ing candidates for election to any offices to be filled at the same election. A second ballot count shall then be made, in which the candidate receiving the majority quota shall be declared elected President and the candidate receiving the second highest vote shall be declared elected Vice-President.

*Article IX: Editorial Staff*

The Editorial Staff shall consist of a Chairman, chosen by ballot of the Council, and eight (8) other members of the Society, who shall be recommended by the Chairman and appointed by the President. The Chairman shall be designated Editor-in-Chief. The Chairman and other members of the Editorial Staff shall serve for two years, or until their successors are appointed. The Staff shall have charge of the official publication of the Society and shall decide all matters related to its publication, subject to such conditions as may be imposed by the Council.

*Article X: Meetings*

SECTION 1: The Society shall hold an annual meeting and such other meetings as the Council may direct. The place and date of the annual meeting shall be selected and adequate notice given to the Society at least six months in advance of the date fixed for the meeting.

SECTION 2: A quorum shall consist of forty (40) voting members.

SECTION 3: Upon order of the Council or by direction of a majority of the voting members present at a business meeting of the Society, any question shall be submitted to the membership for decision by letter ballot.

*Article XI: Sections*

SECTION 1: Sections of the Society may be authorized by the Council upon the written petition of ten (10) or more voting members, at least five (5) of whom shall be Senior Members or Fellows, resident within a territory small enough to justify the belief that a strong local organization may be effected. Sections must hold at least one meeting each year to retain their authorizations.

SECTION 2: The officers of each section shall include a Chairman, a Secretary, and such others as may be found necessary. Section officers shall be voting members of the Society.

SECTION 3: Any section may, subject to the approval of the Council, adopt for its own government such by-laws as it may find expedient, including the qualifications for associate members of the Section, provided that no part thereof shall conflict with the Constitution of the Society.

SECTION 4: The Council shall have the right at any time to rescind the authorization of any section and to terminate its existence.

*Article XII: Subject Divisions*

Subject divisions of the Society may be authorized by the Council upon the written petition of twenty (20) or more voting members of the Society engaged in the special field of forestry to which the division pertains, at least five (5) of whom shall be Senior Members or Fellows of the Society. Subject divisions shall be organized only as the Council is convinced at their need, and they shall be regulated through by-laws established by the Council.

*Article XIII: Amendment*

The Constitution may be amended by a two-thirds vote of the members voting, provided the proposed amendments have been submitted to all voting members at least four weeks in advance of the date set by the Council for counting the ballots. Amendments shall, unless they themselves provide otherwise, be effective immediately upon their adoption.

## Advantages of Proportional Representation

The following quotations are from an address on "Two Forms of City Manager Plan," delivered by Prof. Lewis Jerome Johnson, of Harvard University, before the Cambridge League of Women Voters. Prof. Johnson, although a professor of civil engineering, has been a keen student of government for many years. He was at one time an ardent advocate of the Bucklin System of preferential voting, sometimes known as the Grand Junction (Colo.) Plan because first introduced there. This system was in use in a number of cities and enjoyed wide popularity among civic reformers a decade or two ago. Prof. Johnson at that time, apparently, had not heard about P. R. or, at least, had not had an opportunity to study it at close range since it was not then in practical use anywhere in America.

"Among the chief reasons for P. R. are its fairness; the confidence and interest in the government which it engenders; the completeness with which it promotes order and decorum in elections; the increased attractiveness it lends to standing for the city council from the viewpoint of those of proven fitness to frame large policies and direct large affairs; the improved prospect it opens and holds open for honest, able, far-seeing leadership in city affairs; the encouragement it offers to progress by reasonably prompt recognition of growing minorities; the safeguard it provides against premature change by the more effective entrenchment it establishes for majority rule—not merely rule by a majority of the representation of one possible majority of all the electorate, but rule by a majority of the representatives of all the considerable groups in the city—*i. e.,* a majority, the personnel of which must be constantly changing according to the question under discussion. That this real majority may have its rightful power is one reason sufficient in itself for systematic minority representation. P. R. retains all the advantages of preferential voting. In fact the P. R. ballot is itself a type of preferential ballot, and the type that experience has shown to be the best suited for its purpose.

"Doubts as to the feasibility of popularizing P. R. in an American city have been dispelled by experience; the practicability of its use even in the highly mixed populations of our great cities has by the same means been demonstrated. And the modern preference for small responsibile city councils, elected without ward or district restrictions and without national party designations, opens the fairest of fields for getting the advantages of P. R."

Continuing, Prof. Johnson warns against expecting the impossible of P. R., saying, "no results can come out

of even the P. R.-manager plan superior to the intelligence which the voters and their representatives put into its use. The supreme and sufficient merit of P. R., the highest merit any political device can have, is that it gives the best means known for turning to account such intelligence and public spirit as exists, and at the same time offers the strongest inducement known for the development of civic comprehension and enduring civic zeal on the part of the whole electorate—both those in office and those not in office."

Concerning the method of ballot counting which many opponents criticize as being too complicated, Prof. Johnson says, "The actual process is found to be readily within the comprehension of upper-grade grammar school pupils. Voters learn to understand the counting system just as they learn the rules of baseball. . . . Experience in this country and elsewhere, especially in Ireland where it is used for selecting the representation of the national parliament of North Ireland as well as of the Free State, proves its practical working simplicity even where used on a nation-wide scale."

L. S. Murphy.

### Clearing the Decks for Action

When the membership, by increasing the dues, dug down into its pockets to pay for a better organization, the Council decided that the first step needed was to improve the handling of our business affairs. Consequently, the members will be glad to have a brief progress report. The foundation of a building is never as spectacular as the belfry, but it nevertheless has its own peculiar virtues.

First, the Journal. We have arranged to relieve the Editor-in-Chief of as much of the grief of the printing and business management as possible by centering responsibility for these in the office of the Secretary. So the printing has been removed from Menasha, Wisconsin, to Baltimore, Maryland, where we can have close personal touch with the printer.

No doubt some of you are a little impatient with changes in the make-up of the Journal. However, we are trying to evolve a thoroughly attractive and permanent format that can henceforth become standard. As our principal ambassador to the world at large, the Journal must maintain an outward appearance worthy of its mission.

Through the initiative of our advertising manager, Mr. Warwick Carpenter, we have asked the Sections to collaborate in making a survey of the kinds and amounts of equipment whose purchase is controlled by foresters and forestry agencies. With this information, which in the aggregate is bound to be impressive, Mr. Carpenter can go to prospective advertisers with convincing facts on the value of the Journal as an advertising medium. Meantime Mr. Carpenter has done much preliminary canvassing and results are beginning to show up.[1]

During the five months since the last Journal appeared, notable progress has been made in overhauling this office, thanks largely to the skillful and devoted work of Mrs. Audrey Hix, office manager, and her assistant, Miss Margaret

[1] See the statement by him on p. 842 in this issue of the Journal.

Haislip, and to the invaluable collaboration of President Butler, Treasurer Chandler, and the Council. Many improvements have been made in handling our permanent records, keeping accounts, expediting correspondence, answering requests, cleaning up back work, settling claims, hastening admissions, etc. It would astonish the average member to know how large a volume of this work there is, and how essential is its proper handling to the welfare of the Society.

With these advances already made and in prospect, our elective officers of the future will have a machine in good working order; and, freed of the harassing burden of routine, will be able to devote their energies and talents to the advancement of the profession and the cause of forestry.

WARD SHEPARD, *Secretary.*

## ADVERTISING AND THE JOURNAL

At the annual meeting of the Society of American Foresters in San Francisco last December, several informal discussions of the possibility of developing advertising for the JOURNAL OF FORESTRY took place. For approximately a quarter of a century the JOURNAL has given complete expression to the progress of professional forestry in this country, until it is now recognized as one of the foremost forestry publications in the world. But with such editorial and professional prestige, little attempt has ever been made to develop its advertising.

Almost every other technical journal of importance in the country carries advertising. Most of these magazines, and particularly those which serve professions important as buying markets, have carefully organized advertising departments. The revenue from this source makes possible more illustrations, better paper, more articles, more systematic editorial attention to the whole field of the profession, and a correspondingly greater service to the profession and to the public. When large groups of manufacturers, dealers, and technicians stand in relation to these professions as a "Service of Supply," the advertising pages give them immediate contact with every important buyer.

There is only one professional forestry magazine in this country, the JOURNAL OF FORESTRY, and it reaches every important buyer of professional equipment and supplies. But it has not brought to these buyers detailed information about their "Services of Supply." It has told them editorially, for instance, about the development of portable pumps as a factor in the control of forest fires, but the forester who must keep up with these developments has been obliged to get all of his detailed information about makers and advantages and price by personal search in other quarters.

All of these points entered into the informal discussions at the last annual meeting. As a result it was agreed that if systematic attention should be given to the creation of an advertising section in the JOURNAL, and if it should be successful, the development of additional revenue for the magazine would be but one of the benefits derived, and probably in the long run by no means the greatest.

But could the JOURNAL OF FORESTRY successfully solicit advertising? It has a circulation of 2200, which as circulations go these days is extremely small.

Obviously no worth while amount of advertising could be expected with a circulation of that size unless it could be proved that the circulation is of special and unusual value and has high buying power for the articles sought to be advertised. Unless it has these last characteristics, it seemed clear that the JOURNAL could not expect successfully to develop its advertising pages.

What is the measure of the buying power of the subscribers to the JOURNAL OF FORESTRY for products used in the practice of forestry? At the annual meeting this question was asked of a number of leading men in the profession, some of whom were among its largest purchasers. Following the meeting similar inquiries were placed before still other foresters in different parts of the country in an effort to uncover some measure of the value of foresters as buyers.

It was surprising how little could be learned. One of the outstanding characteristics of forestry is that it is essentially analytical in its methods, but no one seemed ever to have studied forestry from the standpoint of the actual and potential market that it presents. This is a very practical point if any appreciable amount of advertising is to be sold.

Let the manufacturer of a new product for the building trade consider entering the national market. If he will present his problem to the leading professional architectural magazines he will be given at once a most complete analysis of his possible market. He may learn how many buildings, of the type for which his product is suitable, were built last year or in any period of years, and how much they cost. He may learn how every building dollar that went into the construction of these buildings was spent, for materials, for labor, for equipment. He may learn in what parts of the country buildings of that type are chiefly constructed, and also where there are fewest of them. He may learn who his competitors are, and he will then be given very definite information regarding the extent to which the publications cover this particular market.

We have had nothing of the sort in forestry. In the issue of the JOURNAL for March, 1928, E. Murray Bruner, former State Forester of Kentucky, in an article entitled "Progress in Forest Protection in the South," pointed out that the funds available for forest protection in sixteen southern states, exclusive of national forests, for the fiscal year 1928, totaled $895,228. He also showed that in order to secure adequate protection in these states an additional annual expenditure of $4,271,972 will be required. That is for protection alone. How much more they must spend in regular forestry channels was outside the scope of his article. It is becoming increasingly important to build roads and trails for recreation. As reforestation increases, greater and greater sums are spent each year. Land purchases for national and state forests require still other expenditures, not only for purchases but for surveying, mapping, and administration. We will not hazard a guess as to how much this $5,000,000 annually for protection must be increased in those sixteen states before their complete forestry needs are met. Let some analytical forester tackle this problem and state the answer. It will be interesting and helpful and in large figures.

In imagination expand these figures until they cover the whole United States and Canada. Include every branch of the profession of forestry in which money is professionally spent. Let the picture which results show how much money was spent during the last year or in a recent period of years. Let it project into the future to show the size of the developing market until a reasonably complete job is being done.

Who knows now what these total figures would look like? Who knows how much money was spent in the practice of forestry last year, or during the last ten years? In the next ten years how will the figures of the last few years be increased by development of the potential forestry market? Take these big totals and break them down. What do they mean to the manufacturer of steel towers, portable gasoline pumps, hand pumps, other fire-fighting equipment, surveying instruments, road building machinery, uniforms, equipment for camp and trail, or food supplies?

The profession of architecture can answer similar questions in great detail. In so doing it renders a valuable service both to the profession and to its "Services of Supply." And as a corollary its excellent publications carry large amounts of advertising. Last December forestry could render no similar service.

Therefore, when it was finally decided systematically to develop an advertising department in the JOURNAL OF FORESTRY, it was felt that one of the first steps should be the making of a valuation survey determine the size and importance of the forestry market, including not only gross figures, but as far as possible their detailed break-down. This seemed to be fundamental in any successful campaign to sell advertising space in the JOURNAL. It was also decided that the best way to do this was to ask each Section of the Society to analyze its own territory. Instructions and questionnaires were therefore prepared and sent out by the Washington office to each Section, and the survey is now going on.

No indication of the final result is yet available. Nevertheless, there have already been most interesting developments. So far these are all in the nature of isolated details. The magnitude of the forestry market for certain types of material is well indicated by the fact that in one state a single purchasing unit has recently bought more than 1000 portable spray pumps of a single make. In the same state are many other purchasing units which are also buying large numbers of spray pumps. A manufacturer of portable tool kiosks who had formerly sold extensively to foresters found that this trade had ceased. He wanted to get it back and asked for advice. He was told that the increased development of roads and trails, and particularly automobile transportation, made the use of tool kiosks at frequent intervals no longer necessary, and he was therefore advised to save his effort and incidentally his advertising money. He was, however, given a promising lead for another type of equipment that he is able to manufacture and was put in touch with foresters who can give him expert advice. A whole new section of the forestry market was opened up to another manufacturer through information that came in the preliminary stages of the valuation survey. These instances, which could be multiplied, are enough to show that the valuation survey itself, and a systematically handled

advertising department of the JOURNAL OF FORESTRY, can have real service features quite aside from the development of revenue.

In fact it is one of the outstanding characteristics of advertising today that it must have service behind it if it is to succeed. It is intended that the advertising department of the JOURNAL OF FORESTRY shall be conducted in accordance with this modern business ideal. If it is, it will follow quite easily and naturally that the volume of advertising that should properly be in the JOURNAL OF FORESTRY will come to it and will stay with it.

How much that advertising will amount to is difficult to say. Last December, when the idea was first discussed it did not seem safe to make any kind of a forecast. Now the picture is clearer. We have a market which buys a tremendous amount of material of very special use. It is an expanding market. In ten years it will be so much bigger than today that we will look back upon today as foresters now look back upon forestry before the war, or before President Roosevelt's Conference on Conservation in 1908. The JOURNAL OF FORESTRY covers this present and potential market completely. It will receive the advertising that is suitable for this market.

During the spring and summer first steps have been taken, and some preliminary work has been done. The best results cannot be expected until the valuation survey has been completed and the selling data is in hand; but already more than 25 pages of advertising have been ordered to run in the eight issues between October, 1928, and May, 1929, and the net revenue is nearly $1000. This is a mere start. If optimism is as justified in advertising as in some phases of forestry, it seems reasonable to believe that the JOURNAL OF FORESTRY may expect to carry regularly perhaps 10 pages of advertising in each issue, or about 80 in the course of a publishing season, with a net revenue to the magazine ranging from $3000 to $4000.

In a field like this, all magazines eventually reach a point of practical stabilization in their advertising. For a magazine with a circulation between 2000 and 3000, covering a specialized profession, and with a page rate as low as ours must always be, this forecast seems to be a conservative statement of what we may expect, provided full information of the kind sought in the valuation survey can be obtained. It should meet from one-third to one-half of the annual budget of the magazine as it stood in 1927, and thus provide funds for very substantial improvements. The resulting advantages to the profession and the public are, of course, obvious.

WARWICK CARPENTER,
*Advertising Manager.*

## KOCH AND MILLER CELEBRATE SILVER JUBILEE AS FORESTERS

On Saturday, March 31, sixty-five members of the Northern Rocky Mountain Section of the Society of American Foresters gathered in Missoula and Moscow to celebrate the completion by Elers Koch and F. G. Miller of a quarter century of service as professional foresters. Both affairs were successfully staged as complete surprises to the recipients of the honor.

At the Missoula party Glen Smith functioned as toastmaster. P. J. O'Brien, H. T. Gisborne, O. C. Bradeen, Roscoe Haines, Frank Haun, and Robert Marshall were called upon for toasts, while Dorr Skeels, Fred Morrell, and W. W. White gave longer addresses. In Moscow Dr. Vincent took charge of the program, and called on Ben Bush, W. D. Humiston, Stanley Easton, Dr. Giles, E. E. Hubert, A. D. Decker, and M. I. Bradner for talks. Congratulatory and reminiscent letters and telegrams from all parts of the country were read at both meetings.

Elers Koch was born in Bozeman, Montana, December 12, 1880. He graduated from the Montana Agricultural College in 1901, and from the Yale Forest School in 1903. Immediately after graduation he went to work with the Forest Service, being engaged for a couple of years in determining the proper boundaries for the National Forests in various parts of the West. In 1906, he came to Missoula and took charge of the newly created Lolo National Forest. Since then he has been District Fire Chief for the Northern Rocky Mountain region, and is now Assistant District Forester in charge of Management.

Francis Garner Miller received bachelor degrees at Iowa and Iowa State, and his M. F. at Yale in 1903. He worked in the Forest Service for a few years, and then commenced his life's labor as a teacher. He served upon the forestry faculty at Nebraska and was Dean at Washington, Washington State, and Idaho. He came to the latter forest school in 1917, and has been there ever since.

ROBERT MARSHALL.

## ALLEGHENY SECTION HOLDS SUMMER SESSION AT CLEARFIELD, PA.

The seventh annual summer field trip of the Allegheny Section, Society of American Foresters, was held in the Moshannon Forest District of the State of Pennsylvania. This year's trip was better attended than any of its predecessors, a total of 88 members and guests participating in the program.

The party assembled Wednesday evening, July 25, at Clearfield, Pa., and an informal smoker in the Dimeling Hotel served as a means of renewing old friendships.

The trip started Thursday morning at 8 A. M., and during the day the party inspected the State Game Preserve, temporary and permanent camp sites, fire towers, forest roads and trails, fire lanes, plantations, and the Clearfield State Nursery, with its stock of 35,000,000 seedlings. Lunch was served at the Crystal Springs Rod and Gun Club.

On Thursday evening the party was entertained by the Clearfield Chamber of Commerce at a dinner in the Dimeling Hotel. A total of 175 residents of Clearfield and foresters enjoyed an excellent dinner. Features of the dinner were the two-minute speeches by prominent members; the presentation of a special autographed program of the trip to W. F. Dague upon the completion of 20 years' service as District Forester of the Moshannon District; an illustrated talk by State Forester J. S. Illick, on forestry in the United States and in foreign lands; and blow by blow returns of the Tunney-Heeney Fight.

Friday was spent inspecting the forestry operations of the Clearfield Bituminous Coal Corporation, including

lantations, natural growth, cuttings, n open tank creosote plant for treating nine timbers, and a well-equipped forest nursery. The foresters were the guests f this company for lunch at Stanley's in McGees, which was featured by short alks by Charles E. Dorworth, Commissioner of the State Department of Forests and Waters; D. C. LeFever and W. A. Carnegie, Superintendent and Forester of the Clearfield Bituminous Coal Corporation; and other prominent foresters.

The trip was ably managed by State Forester J. S. Illick, Chairman of the Allegheny Section; R. Lynn Emerick, Chief, Bureau of Information, Department of Forests and Waters; and District Forester W. E. Dague, of the Moshannon Forest District.

HAROLD F. ROUND.

### KYNOCH REPRESENTS SOCIETY AT MEETING OF MECHANICAL ENGINEERS

At the invitation of the Aeronautic Division of the American Society of Mechanical Engineers, President Butler appointed William Kynoch to represent the Society at the Detroit meeting on June 28 and 29. This meeting was held under the auspices of the Detroit Section of the Association. The first day was given over to transport, wood, and power plant sessions, while the second day was occupied with sessions on designs and airships and airways. Two papers were presented on the first day which were of interest to foresters. T. R. Truax, of the Forest Products Laboratory at Madison, spoke on "Gluing Wood in Aircraft Work," and Mr. G. L. Weeks, Jr., of the Fleischmann Transportation Company, New York City, talked on "Applications of Balsa Wood in Aircraft." A third paper was to have been presented by Mr. C. B. Norris on "Plywood as a Material in Aircraft Construction," but was postponed on account of the author's illness.

One of the most interesting points in the paper by Mr. Truax was his discussion of the relation between the specific gravity of wood and the shearing strength of joints made with various glues.

The statement of Mr. Weeks concerning the characteristics of balsa wood included a discussion of its extremely rapid growth in its native habitat in Central and South America. He also presented relative values of balsa as against certain of the spruces for airplane construction which were unusually high. Information was not given, however, to moisture contents of the material and the figures quoted seemed inconclusive to Mr. Kynoch. Mr. Weeks further discussed balsa as a sound-proofing and heat-insulating material. He believes that in the latter capacity it might be of great use in transporting perishable foods.

No business arose at this session which required action by the Society's delegates, but Mr. Kynoch reports an unusually lively discussion on the papers presented at the other sessions.

### A SUGGESTION CONCERNING MEMBERSHIP

It has been urged that the individual members of the Society and the various sections take steps to propose for membership all the forest school graduates

who are eligible in order to increase the membership of the Society and enlist the support of all foresters. This calls to mind a plan which I believe is workable and in keeping with the aims of the Society.

In the face of the criticism recently offered that there are too many classes of members, I wish to suggest another class, namely, junior or student member. The plan would anticipate the forming of sections of the Society at all the forest schools of the country, or at least at those schools which have attained to certain standards that might be set up by the Society.

Students of a prescribed scholastic attainment, upon recommendation by faculty members of the section, would be eligible for membership at the end of the second year of undergraduate work. The organization of each school would be responsible to the Society and the student members would be equally eligible to office in the section with faculty members.

The plan has some advantages that to me seem worthy of serious consideration. First, the students would have the aid of valuable contacts with outstanding members of the profession, and thus keep in touch with many of the research and administrative problems of forestry. Then, too, the members of the Society at large would have the added impetus toward a closer interest in forestry education through the sections of the Society in colleges.

The students would be given a valuable means of self-expression and opportunity to express their views in meetings and in print. For instance, one issue of the JOURNAL each year might be set aside for student articles. Lastly, the plan if put into effect would catch the kind of members we need while they are still young. It is not probable that a student would sever his connections with the Society after graduation.

This or a similar policy is followed by many of the technical societies in respect to students in the colleges of the country. Nearly all the better technical schools have branches of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the American Society of Civil Engineers on the campus. The idea, therefore, is not original, but if it works for other professions, why not for ours?

J. A. THAYER.

### ANNUAL MEETING IN NEW YORK

The annual meeting of the Society of American Foresters will be held on December 28 and 29 in New York City in conjunction with the American Association for the Advancement of Science. The Committee on Meetings is preparing an interesting and timely program in which Industrial Forestry, Forest Protection, and State Forestry will occupy a major rôle.

The final program, speakers, information on hotels, banquet, etc., will be announced later but begin now to make arrangements to attend this meeting.

### INCORPORATION OF THE SOCIETY

The Executive Council has voted in favor of incorporating the Society.

The method of incorporating, under the laws of the District of Columbia, is

for a small group of men, the majority of whom must be citizens of the District of Columbia, to take out a charter and which must then be accepted by the membership of the Society. Following is a certified copy of the charter: *

No. 19629

CERTIFICATE OF INCORPORATION OF SOCIETY OF AMERICAN FORESTERS

This is to certify that we, whose names are hereunto subscribed, citizens of the United States, a majority of whom are citizens of the District of Columbia, have associated ourselves together, pursuant to provisions of Chapter XVIII, Sub-Chapter III, of the Code of Law for the District of Columbia, approved March 3, 1901, and Acts of Congress amendatory, thereto, under the corporate name of SOCIETY OF AMERICAN FORESTERS.

The term for which the Society is organized is perpetual.

The particular business and objects of the Society are to encourage a broad and constructive practice of forestry; to stimulate research and achievement in the science of forestry; and to advance the profession of forestry through cooperative thought and a spirit of solidarity among foresters.

The number of managers of the Society shall for the first year of its existence be eleven.

Witness our hands this 3d day of October, A. D. 1928.

[SEAL] R. Y. STUART,
9 W. Kirke, Chevy Chase, Md.

[SEAL] R. V. REYNOLDS,
2813 38th St., N. W.

[SEAL] OVID M. BUTLER,
3405 Rodman St., N. W.

[SEAL] JOHN H. FAHRENBACH,
6900 5th St., N. W.

[SEAL] BERNARD A. CHANDLER,
112 Chestnut Ave., Takoma Park, Md.

District of Columbia, *ss*:

I, Margaret S. Sears, a Notary Public in and for the District of Columbia, do hereby certify that R. Y. Stuart, R. V. Reynolds, Ovid M. Butler, John H. Fahrenbach and Bernard A. Chandler parties to the foregoing and annexed Certificate of Incorporation of Society of American Foresters, bearing date on the 3d day of October, A. D. 1928, personally appeared before me in the District aforesaid the said R. Y. Stuart, R. V. Reynolds, Ovid M. Butler, John H. Fahrenbach and Bernard A. Chandler being personally known to me to be the persons who made and signed the said certificate, and severally acknowledged the same to be their act and deed for the purposes therein set forth.

Witness my hand and official seal this 3d day of October, A. D. 1928.

[NOTARIAL SEAL] MARGARET S. SEARS,
*Notary Public, D. C.*

OFFICE OF THE RECORDER OF DEEDS,
DISTRICT OF COLUMBIA.

*This is to Certify* that the foregoing is a true and verified copy of the Certificate of Incorporation of the SOCIETY OF AMERICAN FORESTERS and of the whole of said Certificate of Incorporation, as filed in this office the 4th day of October, A. D. 1928.

* The signees of this charter include all the members of the present Council who were in Washington when it was signed.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of this Office this 4th day of October, A. D. 1928.

Arthur G. Froe,
[seal] *Recorder of Deeds, D. C.*

The membership of the Society will be given an opportunity to vote for or against the acceptance of this charter at the same time that it votes on the revised Constitution.

## Dwight C. Birch

The California section, on July 13, 1928, lost one of its ablest, best-liked, and most promising members. On that day, Dwight C. Birch passed away as a result of an attack of peritonitis, following an acute attack of appendicitis. Birch had recently joined the Sugar Pine Lumber Company to take charge of their logging operations in the Sierra Nevada Mountains, and his death occurred at the Company's "Central Camp" near Northfork.

Birch was born in 1886 at Orland, California, and spent two years of study at the University of California before entering the forestry school of the University of Michigan. He was graduated from Michigan in 1911, and received the Master's Degree in 1913, spending an intervening year with the Forest Service in Montana. In 1913, he became forest assistant on the Sierra National Forest under Redington, and served on that forest until 1917, when he was transferred to the District Office as assistant to the Logging Engineer. During the war he took charge of the logging engineering work for the California district, and remained until the summer of 1919, when he resigned from the Forest Service to join the staff of the Madera Sugar Pine Company, at Madera, California. He became assistant general manager in this organization, but early this year left it for the employ of the Clover Valley Lumber Company. His experience in the Sierra Nevada region, however, was such that he was induced to return by the Sugar Pine Lumber Company, a neighbor of the Madera concern.

Birch is survived by a widow and two children. He was a man of sterling character and had many friends in the lumbering and forestry fields. Professionally, he had a rare combination of high forestry ideals and an understanding of the practical problems of lumbering.

## Announcement of Candidates for Membership

The following names of candidates for membership are referred to Members, Senior Members, and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the May Journal, without question as to eligibility; the names have not been passed upon by the Executive Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before November 15, 1928. Statements on different men should be submitted on different sheets. *Communications relating to candidates are considered by the Council as strictly confidential.*

FOR ELECTION TO GRADE OF MEMBER

| *Name and Education* | *Title and Address* | *Proposed by* |
| --- | --- | --- |
| Abbott, J. H.<br>Penn. State, B. S. F., 1927 | Timber Surveyor, Crossett Lumber Co., Crossett, Ark. | Gulf States Sec. |
| Abell, Charles A.<br>Cornell, B. S. F., 1928 | Junior Forester, Appalachian Forest Experiment Station, Asheville, N. C. | Appalachian Sec. |
| Anderson, Bernard A.<br>Univ. Wash., B. S. F., 1927 | Research Fellow, Forest School, Univ. of Idaho, Moscow, Idaho. | No. Rocky Mt. Sec. |
| Archbold, Chester M.<br>Mich. State College, B. S. F., 1924 | Senior Forest Ranger, U. S. Forest Service, Petersburg, Alaska. | No. Pacific Sec. |
| Arnold, LeRoy D.<br>Univ. Mich., B. S. F., 1917 | Supt., Klamath Indian Agency, Oregon. | No. Pacific Sec. |
| Baker, Richard Smith<br>Cornell, B. S. F., 1924 | City Forester, Ithaca, N. Y. | New York Sec. |
| Becraft, Raymond J.<br>Utah Agric., B. S., 1917<br>Iowa State, M. S., 1923<br>Univ. Chicago, 1926-27, Fellow in Botany | Asst. Prof., Range Management, Utah Agric. College, Logan, Utah. | Intermountain Sec. |
| Bennett, Frank W.<br>La. Univ., B. S. F., 1927 | Forester, Div. of Forestry, Department of Conservation, New Orleans, La. | Gulf States Sec. |
| Betensen, Blaine<br>High School | Asst. Forest Supervisor, U. S. F. S., Salt Lake City, Utah. | Intermountain Sec. |
| Blake, Clyde D.<br>High School | Asst. Supervisor, U. S. F. S., Grangeville, Idaho. | No. Rocky Mt. Sec. |
| Bloom, Charles,<br>Univ. Mont., B. S. F., 1927 | Forest Ranger, U. S. F. S., Thompson Falls, Montana. | No. Rocky Mt. Sec. |
| Buchenroth, Felix<br>Beal School (Germany), B. A., 1904 | Sr. Forest Ranger, U. S. F. S., Jackson, Wyoming. | Intermountain Sec. |
| Buckingham, W. E.<br>High School, 3 yrs. School of For., Univ. Idaho | Sr. Forest Ranger, U. S. F. S. Orofino, Idaho. | No. Rocky Mt. Sec. |
| Carnegie, William A.<br>Penn. State, B. S. F., 1925 | Forester, Clearfield Bituminous Coal Corp., Clymer, Pa. | Allegheny Sec. |
| Case, Paul C.<br>Oregon State College, B. S. F.,<br>Yale Forest School, M. F., 1927 | Forest Assistant, Klamath Indian Agency, Oregon. | North Pacific Sec. |
| Centerwall, Willard R.<br>4 yrs. Univ. Montana, no degree | Cruiser, U. S. Indian Service, Dixon, Montana. | No. Rocky Mt. Sec. |
| Clave, William<br>Ranger School, N. Y. State Col. For., 1920 | County Agent, Blister Rust Control, Gardner, Mass. | New England Sec. |
| Cochrell, Albert N.<br>Short Course in For. at Univ. of Idaho | Asst. Supervisor, U. S. F. S., Newport, Wash. | No. Rocky Mt. Sec. |

| Name and Education | Title and Address | Proposed by |
|---|---|---|
| Cory, Floyd W.<br>Univ. Mich., B. S. F., 1924<br>Univ. Wash., M. S. F., 1927 | Jr. Forester, U. S. F. S., Portland, Oregon. | North Pacific Sec. |
| Cossitt, Floyd M.<br>Univ. Idaho, B. F., 1924 | Jr. Forester, U. S. F. S., Newport, Wash. | No. Rocky Mt. Sec. |
| Cramer, Albert J.<br>3⅜ yrs. forestry work, Univ. Montana | Sr. Forest Ranger, U. S. F. S., Trego, Montana. | No. Rocky Mt. Sec. |
| Currier, H. R.<br>Public schools | Asst. Supervisor, U. S. F. S., Laconia, N. H. | New England Sec. |
| Decker, Arlie D.<br>Univ. Idaho, B. S. F., 1913<br>Yale, M. F., 1917 | In Charge of Cedar Pole Dept., Potlatch Lumber Co., Potlatch, Idaho. | No. Rocky Mt. Sec. |
| Ewart, George Robert III<br>Cornell, B. S. F., 1928 | Forester, Bishop Estate, Honolulu, Hawaii. | J. Nelson Spaeth<br>C. H. Guise<br>S. N. Spring<br>R. S. Hosmer |
| Fitting, Ray R.<br>3 yrs. for. work, Univ. Montana | Supervisor, U. S. F. S., Thompson Falls, Montana. | No. Rocky Mt. Sec. |
| Foltz, Frank<br>Penn. State, B. S. F., 1917 | Asst. Supervisor, U. S. F. S., St. Maries, Idaho. | No. Rocky Mt. Sec. |
| Forward, Charles H.<br>Univ. Wash., B. S. F., 1926 | District Ranger, U. S. F. S., Anchorage, Alaska. | North Pacific Sec. |
| Gibbs, Frank J.<br>Mich. State College, B. S. F., 1927 | Asst. State Forester, Oklahoma City, Okla. | George R. Phillips<br>A. K. Chittenden<br>R. F. Kroodsma |
| Gosnell, J. W.<br>Mich. State, B. S. F., 1927 | Asst. State Forester, Oklahoma City, Okla. | George R. Phillips<br>A. K. Chittenden<br>R. F. Kroodsma |
| Gottlieb, Albert W.<br>N. Y. State Col. For., B. S. F., 1926, Harvard, M. F., 1927 | Jr. Scientific Aid, Northeastern For. Exp. Sta., Amherst, Mass. | New England Sec. |
| Groenewold, Carl A.<br>N. Y. State Col. For., B. S. F., 1928 | Cruising and field operations, St. Lawrence Paper Mills, Ltd., Three Rivers, P. Q., Canada. | Paul D. Kelleter<br>H. C. Belyea<br>H. P. Brown<br>C. H. Guise |
| Gross, Elroy H.<br>Univ. Maine, B. S. F., 1927 | Forest Engineer, International Paper Co., New Brunswick, Canada. | John M. Briscoe<br>C. W. L. Chapman<br>Gilbert I. Stewart |
| Gustofson, Carl A.<br>Univ. Idaho, B. S. F., 1927 | Forest Ranger, U. S. F. S., Salt Lake City, Utah. | Intermountain Sec. |
| Hartman, Arthur W.<br>Penn. State, B. S. F., 1913 | Sr. Forest Ranger, U. S. F. S., Mena, Arkansas. | Gulf States Sec. |
| Heberling, Ralph B.<br>Penn. State, B. S. F., 1925 | Asst. Dist. Forester, Clearfield, Pa. | Allegheny Sec. |
| Hogan, Jack B.<br>Iowa State, B. S. F., 1926 | Jr. Forester, U. S. F. S., Portland, Oregon. | North Pacific Sec. |
| Holbrook, Wellman<br>High School | Forest Examiner, U. S. F. S., Juneau, Alaska. | North Pacific Sec. |

| *Name and Education* | *Title and Address* | *Proposed by* |
| --- | --- | --- |
| Holliday, James W. K.<br>Penn. State, B. S. F., 1928 | State District Ranger, Bluefield, W. Va. | Allegheny Sec. |
| Hutton, George Wilson<br>Univ. Wash., B. S. F., 1913<br>Yale, M. F., 1914 | Manager and President, Central Planting Mill, Vancouver, Wash. | North Pacific Sec. |
| Jefferson, Lorenzo F.<br>2 yrs. for., Univ. Mont. | Asst. Supervisor, U. S. F. S., Sandpoint, Idaho. | No. Rocky Mt. Sec. |
| King, Charles K.<br>High School<br>I. C. S. surveying and mapping course | Chief, Eastern Division, Forest Engineering Dept., International Paper Co., Fredericton, N. B. | New England Sec. |
| King, F. C.<br>3 yrs. Gould's Academy, Bethel, Me. | Local Manager, Brown Co., Oquossoc, Me. | New England Sec. |
| Kumber, Charles G.<br>Univ. Montana, B. S. F., 1927 | Jr. Forester, U. S. F. S., St. Maries, Idaho. | No. Rocky Mt. Sec. |
| Kuppe, Adolph J. W.<br>Penn. State, B. S. F., 1925 | Asst. District Forester, Stroudsburg, Pa. | Allegheny Sec. |
| Lansdon, William Henry<br>Univ. Idaho, B. S. F., 1927 | Asst. Lumber Grader, Potlatch Lumber Co., Potlatch, Idaho. | No. Rocky Mt. Sec. |
| Larsen, W. W.<br>Ranger course, 1924-25<br>Univ. of Montana | Sr. Forest Ranger, U. S. F. S., West Yellowstone, Montana. | No. Rocky Mt. Sec. |
| Latham, Orrin L.<br>Iowa State, B. S. F., 1927 | Forest Ranger, U. S. F. S., Ogden, Utah. | Intermountain Sec. |
| Lee, Bernard<br>Univ. Mont., B. S. F., 1926 | Forest Ranger, U. S. F. S., Portland, Oregon. | No. Rocky Mt. Sec. |
| Libby, Josiah A.<br>Oreg. Agric., B. S. F., 1927 | Technical Asst., U. S. F. S., Logan, Utah. | Intermountain Sec. |
| Lockhart, William E.<br>1 yr. ranger school, Univ. Montana | Supervisor, U. S. F. S., Choteau, Montana. | No. Rocky Mt. Sec. |
| Lommasson, Thomas<br>3 yrs. for. work, Univ. of Idaho | Inspector of Grazing, U. S. F. S., Missoula, Mont. | No. Rocky Mt. Sec. |
| Maneja, Cecilio<br>Univ. Manila, L. L. B., 1925<br>Yale, M. F., 1928 | Asst. Chief, Div. Forest, Lands & Maps, Bu. of Forests, Philippine Islands. | R. C. Bryant<br>H. H. Chapman<br>H. S. Graves |
| Mead, Ernest J.<br>2 yrs. Beloit Coll., 1905-7; for. school of Univ. Mich., 1913-14 | Forest Engineer, The Texas Co. Beaumont, Texas. | Gulf States Sec. |
| Moore, Frank S.<br>High School<br>1 yr. commercial | Supervisor, U. S. F. S., Montpelier, Idaho. | Intermountain Sec. |
| Nord, Arthur G.<br>High School, 1912; corres. course in for. given by U. S. F. S. | Supervisor, U. S. F. S., Vernal, Utah. | Intermountain Sec. |
| Oettmeier, William M.<br>Mont. Alto, B. S. F., 1926 | Asst. Forester, Suwannee Forest, Superior Pine Products Co., Fargo, Ga. | Southeastern Sec. |

| *Name and Education* | *Title and Address* | *Proposed by* |
|---|---|---|
| Ochsner, Herbert Edward<br>Univ. Mich., B. S. F., 1926<br>Univ. Mich., M. S. F., 1927 | Asst. Ranger, U. S. F. S., Hot Springs, Ark. | Gulf States Sec. |
| Olsen, Chester J.<br>High School<br>1 yr. Utah Agric. Col. | Asst. Supervisor, U. S. F. S., Richfield, Utah. | Intermountain Sec. |
| Pessin, L. J.<br>Univ. Ga., B. S., 1916<br>(School of For., 1912-15)<br>Johns Hopkins, Ph. D., 1923 | Assoc. For. Ecologist, U. S. F. S. Southern Forest Experiment Sta., New Orleans, La. | Gulf States Sec. |
| Polleys, E. G.<br>Univ. Nebr., B. S. F., 1910 | Sec.-Treas., Polleys Lumber Co., Missoula, Mont. | No. Rocky Mt. Sec. |
| Rettig, Edwin C.<br>Univ. Idaho, B. S. F., 1919 | Land Agent, Clearwater Timber Co., Lewiston, Ida. | No. Rocky Mt. Sec. |
| Roemer, A. A.<br>Univ. Mont., B. S. F., 1927 | Jr. Range Examiner, U. S. F. S., Argenta, Montana. | No. Rocky Mt. Sec. |
| Rotschy, Samuel<br>Oreg. Agric., B. S. F., 1925<br>Yale, M. F., 1927 | Forest Protection Work, U. S. F. S., Vancouver, Wash. | North Pacific Sec. |
| Schilling, Erwin A.<br>Colo. Agric., B. S. F., 1926 | Forest Ranger, U. S. F. S., Livingston, Montana. | No. Rocky Mt. Sec. |
| Schwan, Herbert E.<br>Univ. Mont., B. A., 1928 | Jr. Range Examiner, U. S. F. S., Missoula, Montana. | No. Rocky Mt. Sec. |
| Shannon, Claude C.<br>2 yrs. High School | Sr. Forest Ranger, U. S. F. S., Victor, Idaho. | Intermountain Sec. |
| Simcoe, Philip S.<br>Univ. Wash., B. S. F., 1927 | Jr. Forester, Blister Rust Control, Spokane, Wash. | No. Rocky Mt. Sec. |
| Smith, Earl<br>Yale, B. A., 1925<br>Yale, M. F., 1927 | Consulting Forester, Kings & Westchester Land Co., Lake Waccabuc, N. Y. | New England Sec. |
| Smith, Harold Pitt<br>Penn. State, B. S. F., 1926<br>Cornell, M. F., 1927 | Forest Ranger, Indian Service, Flathead Indian Agency, Dixon, Mont. | No. Rocky Mt. Sec. |
| Stauffer, Jacob M.<br>Penn. State, B. S. F., 1925 | State Forest Inspector, Montgomery, Ala. | Gulf States Sec. |
| Storm, Earle V.<br>Oreg. Agric., B. S. F., 1920 | Forest Ranger, U. S. F. S., Kanab, Utah. | Intermountain Sec. |
| Tennant, Earl C.<br>Univ. Mont., B. S. F., 1926 | Asst. Forest Ranger, U. S. F. S., Missoula, Mont. | No. Rocky Mt. Sec. |
| Thieme, Fred E.<br>Univ. Mont., B. S. (Eng.), 1912 | District Engineer, U. S. F. S., Missoula, Mont. | No. Rocky Mt. Sec. |
| Thompson, John Bernard<br>Univ. Mont., B. S. F., 1926 | Forest Ranger, U. S. F. S., Gallatin Gateway, Mont. | No. Rocky Mt. Sec. |
| Toole, Arlie W.<br>Univ. Idaho, B. S. F., 1927 | Deputy State Forester, Moscow, Idaho. | No. Rocky Mt. Sec. |
| Van Meter, Thomas H.<br>Univ. Mont., B. S. F., 1926 | Forest Ranger, U. S. F. S., St. Anthony, Idaho. | Intermountain Sec. |
| Van Winkle, Harry H.<br>Univ. Mont., B. S. F., 1927 | Forest Ranger, U. S. F. S., Moab, Utah. | Intermountain Sec. |

| Name and Education | Title and Address | Proposed by |
|---|---|---|
| Walling, Willoughby H. Cornell, B. S. F., 1927 | Sr. Forest Ranger, U. S. Indian Service, Klamath Agency, Oregon. | North Pacific Sec. |
| Wallis, Francis Common school | Asst. Supervisor, U. S. F. S., Emmett, Idaho. | Intermountain Sec. |
| West, J. William Iowa State, B. S. F., 1926 | Forest Ranger, U. S. F. S., McCall, Idaho. | Intermountain Sec. |
| White, Harold Z. Univ. Ida., B. S. F., 1926 | In Charge of Dry Kiln Dept., Clearwater Timber Co., Lewiston, Idaho. | No. Rocky Mt. Sec. |
| Wible, Ralph C. Penn. State, B. S. F., 1927 | Asst. Forester, Research and Publication Work, Harrisburg, Pa. | Allegheny Sec. |
| Wilde, Kenneth E. Mich. State, B. S. F., 1924 | Forest Ranger, U. S. F. S., McCall, Idaho. | Intermountain Sec. |
| Wolf, Ernest T. Iowa State, B. S. F., 1914 | Supervisor, U. S. F. S., Sandpoint, Idaho. | No. Rocky Mt. Sec. |
| Zeh, William H. Univ. Mont., B. S. F., 1921 | Forest Examiner, Indian Service, Spokane, Wash. | North Pacific Sec. |

FOR ELECTION TO GRADE OF SENIOR MEMBER (BY REINSTATEMENT)

| | | |
|---|---|---|
| Arrivee, David A. Univ. Minn., B. S. F., 1911 | Asst. Supervisor, U. S. F. S., St. Anthony, Idaho. | Intermountain Sec. |
| Parkinson, Dana Dartmouth, A. B., 1908 Yale, M. F., 1910 | Asst. District Forester, U. S. F. S., Ogden, Utah. | Intermountain Sec. |

FOR ELECTION TO GRADE OF SENIOR MEMBER (FROM MEMBER)

| | | |
|---|---|---|
| Hall, S. J. N. Y. State Col. of For., B. S. F., 1920 (Member 1924) | Director, James D. Lacey Co., Jacksonville, Fla. | Southeastern Sec. |
| Hurtt, Leon C. Univ. Nebr., B. S. F., 1914 (Member 1921) | Supervisor, U. S. F. S., Helena, Montana. | No. Rocky Mt. Sec. |
| Merrill, Perry H. N. Y. State Col. of For., B. S. F., 1917 Yale, M. F., 1924 (Member 1923) | Asst. State Forester, Montpelier, Vt. | New England Sec. |
| Wheeler, William C. Univ. N. H., B. S. F., 1919 (Member 1922) | Consulting Forester, Bangor, Me. | New England Sec. |

FOR ELECTION TO GRADE OF ASSOCIATE MEMBER

| | | |
|---|---|---|
| Humiston, W. D. | Asst. Gen. Manager, Potlatch Lumber Co., Potlatch, Idaho. | No. Rocky Mt. Sec. |

J. G. PETERS,
*Member of Executive Council in Charge of Admissions.*

# SECTIONS OF THE SOCIETY OF AMERICAN FORESTERS FOR 1928

### Allegheny

J. S. Illick, Chairman, Department of Forests and Waters, Harrisburg, Pa.
K. E. Pfeiffer, Vice-Chairman, 1411 Fidelity Bldg., Baltimore, Md.
H. F. Round, Secretary, Forester's Office, Pa. R. R. Co., Philadelphia, Pa.

### Appalachian

C. F. Korstian, Chairman, Appalachian Forest Experiment Station, Asheville, N. C.
M. A. Mattoon, Vice-Chairman, U. S. Forest Service, Asheville, N. C.
John W. McNair, Secretary, U. S. Forest Service, Asheville, North Carolina.

### California

C. Stowell Smith, Chairman, 600 Call Building, San Francisco, Calif.
F. S. Baker, Secretary, 305 Hilgard Hall, Berkeley, Calif.

### Central Rocky Mountain

Fred R. Johnson, Chairman, Forest Service, Denver, Colo.
Allen S. Peck, Vice-Chairman, Forest Service, Denver, Colo.
H. D. Cochran, Secretary, Forest Service, Denver, Colo.

### Gulf States

E. L. Demmon, Chairman, 326 Custom House, New Orleans, La.
N. D. Canterbury, Secretary, New Court House, New Orleans, La.

### Intermountain

L. F. Watts, Chairman, Forest Service, Ogden, Utah.
E. C. Sanford, Vice-Chairman, Forest Service, Montpelier, Idaho.
J. O. Stewart, Secretary, Forest Service, Ogden, Utah.

### Minnesota

E. G. Cheyney, Chairman, University Farm, St. Paul, Minn.
J. A. Mitchell, Secretary, University Farm, St. Paul, Minn.

### New England

E. C. Hirst, Chairman, 11 Tahanto St., Concord, N. H.
A. C. Cline, Secretary, Harvard Forest, Petersham, Mass.

### New York

Samuel N. Spring, Chairman, Cornell University, Ithaca, N. Y.
J. Nelson Spaeth, Secretary, Cornell University, Ithaca, N. Y.

### Northern Rocky Mountain

W. W. White, Chairman, U. S. Forest Service, Missoula, Mont.
R. N. Cunningham, Secretary, U. S. Forest Service, Missoula, Mont.

### North Pacific

Geo. W. Peavy, Chairman, Oregon State Agricultural College, Corvallis, Ore.
William F. Ramsdell, Member of Executive Committee, Box 4137, Portland, Ore.
E. J. Hanzlik, Secretary, Box 4137, Portland, Ore.

### Ohio Valley

J. C. DeCamp, Chairman, Michigan State College, East Lansing, Mich.
E. V. Jotter, Secretary, University of Michigan, Ann Arbor, Mich.
B. E. Leete, Chairman of Membership Committee, Room 51, First National Bank Bldg., Portsmouth, Ohio.

### Southeastern

Lenthall Wyman, Chairman, Starke, Florida.
I. F. Eldredge, Vice-Chairman, Superior Pine Products Co., Fargo, Ga.
S. J. Hall, Secretary, James D. Lacey Co., Jacksonville, Fla.

### Southwestern

Hugh G. Calkins, Vice-Chairman, U. S. Forest Service, Albuquerque, N. M.
Quincy Randles, Secretary, Forest Service, Albuquerque, New Mexico.

### Washington

George P. Ahern, Chairman, Woodley Apartments, Washington, D. C.
E. Morgan Pryse, Secretary, Office of Indian Affairs, Washington, D. C.
R. E. Marsh, Member of Executive Committee, Forest Service, Washington, D. C.

### Wisconsin

Arthur Koehler, Chairman, Forest Products Laboratory, Madison, Wis.
R. P. A. Johnson, Secretary, Forest Products Laboratory, Madison, Wis.


Join!
Partners in Service